VIEW

OF

THE MINERALOGY, AGRICULTURE,

MANUFACTURES AND FISHERIES

OF

THE ISLAND OF ARRAN.

WITH

NOTICES OF ANTIQUITIES,

AND

SUGGESTIONS FOR
IMPROVING THE AGRICULTURE AND FISHERIES
OF THE HIGHLANDS AND ISLES
OF SCOTLAND.

By The Rev. JAMES HEADRICK.

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1807.

TO

THE RIGHT HONOURABLE

SIR JOSEPH BANKS, K. B.

PRESIDENT OF THE ROYAL SOCIETY,

&c. &c. &c.

SIR,

YOUR perſevering, meritorious, and ſucceſsful exertions, to extend the bounds of Science, and to render it ſubſervient to Agriculture, and other uſeful arts, encourage me to inſcribe the following pages to you. They conſiſt of inquiries which owed their commencement in this country to your animating example. A detailed account of one of the Hebridian Iſles, not unintereſting to the geologiſt, cannot find a more deſirable ſhelter for its many imperfections, than under the patron-

age of that man, who firſt diſcovered and made known the wonders of Staffa, the greateſt mineral curioſity of the Hebrides, if not of the world.

I inſcribe theſe pages to you, Sir, with the greater pleaſure, as it affords me an opportunity of expreſſing my gratitude for the kindneſs and civilities I experienced from you while in London; and of manifeſting my eſteem for your talents and virtues.

I have the honour to remain, with the higheſt reſpect,

SIR,

Your moſt obedient,

and very humble Servant,

JAMES HEADRICK.

EDINBURGH,
May 12. 1807.

THE author of the following work, having been occaſionally employed, during ſeveral years, by reſpectable noblemen and gentlemen, in making agricultural and mineralogical ſurveys of their properties in the Highlands and Iſles of Scotland, humbly flatters himſelf he has collected a maſs of facts, which are not only intereſting to the individuals who employed him, but to the public at large. Under this impreſſion he ventures to iſſue a volume, as a ſpecimen of other ſimilar works, if this ſhould be ſo fortunate as to meet with public approbation.

It may be neceſſary to enter into an explanation of the plan which the author has ad-

opted, and which he means to follow out, ſhould he be encouraged to publiſh other ſimilar works.

He alludes chiefly to the mineralogical department of his work. On the one hand, he might have preſented an arranged liſt of all the rocks and minerals he obſerved in Arran. But this would have only ſhown the materials of which the building was conſtructed; while it kept out of view the ſkill of the Architect, and the order in which He had choſen to arrange them. The plan he has choſen is that of locality; dividing the iſland into diſtricts, marked by natural boundaries; and deſcribing each mineralogical phenomenon in the order in which it would occur to a traveller who choſe to follow the ſame route. Though conſcious that this plan neceſſarily induces a frequent repetition of the ſame ideas, the author cannot ſee how this repetition can be avoided, without rendering himſelf unintelligible.

The

The author anticipates another objection—That his deſcriptions of minerals are too long-winded, and tireſome. To this objection he pleads *guilty;* and the only defence he would humbly offer, is, that Mineralogy being made up of a *ſlang*, unmeaning, and diſguſting, to men of intelligence; and being, further, adumbrated by crude and abſurd theories, ſhe cannot yet rear her head, and aſſume the rank of a ſcience. Mineralogy never can be raiſed to the rank of a ſcience by picking up ſtones along a ſea-beach, or by compoſing crude theories from ſpecimens collected in the cloſet. This deſireable effect can only be produced by grappling with mountains; by accurate obſervation; and by minute deſcription of nature.

No ſubject calls more loudly for reform than the nomenclature of Mineralogy. Every one is ſenſible of the great advantage which Chemiſtry has derived from an improved, though imperfect nomenclature. It is thought the

ſame method might be followed with Mineralogy, and that names might be invented which would at once expreſs the chemical compoſition, together with the moſt ſtriking external character of minerals. Until this is done, the author generally contents himſelf with the names commonly uſed in this country; and when foreign words are introduced, he is anxious to explain the ſenſe in which he uſes them. His ſole wiſh is to be underſtood,—as he views mineralogy in ſubſerviency to agriculture in determining the quality of ſoils.

He has annexed deſcriptions of the rocks which occurred, by the late Dr Walker, who may be juſtly reckoned the father of Mineralogy in this country. Theſe were dictated in Latin, a few months before his death; and are a ſummary of more than twenty volumes of remarks on minerals, collected by the Doctor during his long and laborious life. It was edifying to behold a man, venerable by years and

uſeful

uſeful labours, after he was ſtone-blind, was worn down by indiſpoſition and by domeſtic affliction, ſtifling his inward ſorrows, and diſplaying all the ardour of youth in ſcientific purſuits.

With regard to the ſhells deſcribed (p. 293.) as abounding in baſaltic columns, at *Garbhe*, one of the Shiant Iſles, ſome further explanation ſeems neceſſary. The author has learnt, with regret, that Dr Hope, Profeſſor of Chemiſtry in this Univerſity, had landed in the bay alluded to, but did not ſee the ſhells. In fact, the ſhells are not preciſely in the bay; but in the range of columns ſituated between the bay and a wacken promontory through which the ſea has formed a ſtupendous arch. The circumſtance that led the author to obſerve theſe ſhells, was, having landed in the bay from a ſmall ſkiff, a violent ſquall aroſe, which obliged the people to run for ſafety through the arch deſcribed. The author was

obliged

obliged to ſcramble over the columnar fragments to the wacken promontory, before he could regain the boat. It was during this ſcramble that he obſerved numerous ſhells, firſt in the baſaltic fragments, and afterwards traced them in the lower parts of columns of great altitude. If any perſon has the curioſity to examine this ſingular fact, it is hoped this explanation is ſo full and preciſe, that he cannot fail to obſerve it. Without the accident alluded to, the author would not have come in the way of the ſhells.

Arran is commonly reckoned an epitome of the mineral ſtructure of the globe, exhibiting, in regular progreſſion, the ſucceſſive formations of ſtrata, from the primary granite to the lateſt formed ſandſtone. It has hence been much reſorted to by our world-makers, who were in queſt of arguments to ſupport their theories. This may be pleaded as another excuſe for a more elaborate expoſition of the facts that were

were obſerved, than might otherwiſe be neceſſary. It will be ſeen, that no received theories will account for the phenomena,—that granite has undergone at leaſt one revolution, and that the ſtrata of pudding and ſandſtone have undergone not leſs than three revolutions, of decompoſition, and recompoſition, before they were brought into the ſtate in which we now find them.

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OF THE

MINERALOGY, AGRICULTURE, MANUFACTURES, FISHERIES, &c. &c.

OF THE

ISLAND OF ARRAN.

NAME.

PERSONS ſkilled in the Gaëlic derive the word *Arran* from various ſources. The late Reverend John Hamilton (Statiſtical Account, vol. IX. p. 165.) derives the name from a battle fought by Fingal, againſt a ſon of a king of Norway, on the north of the iſland, in which the Norwegians were all ſlain. Hence he compounds the name of *Ar-fhin*, the ſlaughter of Fin, or Fingal. I found this etymology to correſpond with the popular traditions.

But the late Rev. Gerſham Stewart, (vol. VIII. p. 578.), with more probability, derives the name from *Ar*, high, and *In*, iſland.

In Gaëlic, *Arran* means bread; and ſome derive the name from the natural fertility of the diſtrict on the ſouth end of the iſland.

SITUATION AND EXTENT.

THIS iſland is ſituated near the mouth of the Frith of Clyde, having the mouth of Lochfine towards the north; in one place, diſtant from Kintyre, on the weſt, only five or ſix miles; its neareſt point to Campbelton in Kintire being about twelve miles; its neareſt point to the iſland of Bute, on the north-eaſt, may alſo be about twelve miles; its neareſt point to the new harbour of Ardroſſan, on the eaſt, may be about fifteen miles; and from Broddick Bay, or Lamlaſh, to the ſame harbour, or to Saltcoats, may be about twenty miles. Thus, this iſland is ſituated much nearer to the coaſt of Argyle than of Airſhire; and it may be conſidered as a link in the great chain of the Grampians from Aberdeen on the north-eaſt. The ſtupendous rock of Ailſa, ſituated about thirty miles to the ſouth of Arran, may be conſidered as another link in this chain. I have been told this rock is moſtly compoſed of granite; and from it the chain is continued through the mountainous parts of Carrick, until it terminates at the Mull of Galloway.

The greateſt length of this iſland, from north-eaſt to ſouth-weſt, may be about thirty-four or thirty-

thirty-five miles; its breadth varying from about fifteen to twenty miles. But as no geometrical ſurvey has been made of it, theſe dimenſions are only deduced from conjecture. *

* The natives reckon the iſland twenty-four miles long; but two of their computed miles are hardly ſhort of three Engliſh.

POLITICAL STATE.

This iſland, together with Bute, forms a county under the name of the latter; of which Rothſay in Bute is the capital. In conſequence of the Union, this county was claſſed with Caithneſs, in the north of Scotland, in returning a repreſentative to Parliament. The two counties return a repreſentative *per vices*, ſo that one of them is always unrepreſented.

As Caithneſs is rapidly advancing in improvement and importance, a propoſal has been entertained there to apply for a conſtant repreſentation of that county. But it is difficult to ſee how this can be done, without unhinging the Union.

It is curious to obſerve the different aſpects in which people, at different periods of ſociety, view political inſtitutions. It is certain that Parliaments were not originally an invention of the people, but of our kings, who had no other means of getting their power recognized, except in a numerous aſſembly. Our kings never acquired ſtrength ſufficient to keep in order their ruffian nobles; and though they often procured the enactment of wiſe and ſalutary laws, they knew theſe laws could not be executed without the concurrence of all the leading

leading men in the community. At firſt, every freeholder was bound to perſonal attendance, which was regarded by moſt of them as an intolerable grievance. Even the idea of repreſentation, which never occurred to the Greeks and Romans, was not an invention of the people, but of the kings. Being perpetually haraſſed with petitions from the ſmaller barons, claiming exemption on account of poverty, or other cauſes, they propoſed that all the freeholders of a diſtrict ſhould unite in chooſing a perſon to act for them, and pay him for his trouble. Thus, a diſtinction was gradually eſtabliſhed between the greater and leſſer barons;—or rather thoſe who continued to give perſonal attendance, and thoſe who concurred in chooſing a repreſentative.

Even after repreſentation was introduced, we find ſeveral towns and counties in Scotland pleading poverty, and inability to pay a repreſentative his neceſſary expenſes, and on theſe grounds claiming an exemption. It was from repreſentations of this ſort that the county of Caithneſs was claſſed with that of Bute, in the Union Parliament.

Little were our ancient kings aware, that an aſſembly, which they regarded as the evidence and organ of their power, and in which they were ſo earneſt to force a numerous attendance, by penalties and other means of compulſion, would in time become a formidable check upon them. Nor

were the people aware, that the office of repreſentative, which they could hardly get perſons to undertake for a liberal hire, would come not only to be diſcharged for nothing, but would even become an object of violent competition, and often aſpired to through bribery.

The Duke of Hamilton's factor is a juſtice of the peace, and baron-baillie within the iſland of Arran. From his deciſions an appeal lies to the Sheriff of Bute at Rothſay. He may impriſon a delinquent during forty-eight hours in Arran caſtle, until he can be ſent to the county jail at Rothſay. Few crimes are committed; and capital offences are never heard of. The county is under the juriſdiction of the Circuit Court of Juſticiary at Inverary, in which all capital caſes are diſcuſſed; and appeals, in civil caſes, are decided by a Jury. The Sheriffs of our counties generally wave their juriſdiction in capital caſes; becauſe their deciſions are not final, but ſubject to the review of the High Court of Juſticiary.

ECCLE-

ECCLESIASTICAL STATE.

The iſland contains two very extenſive pariſhes, thoſe of Kilbride and Kilmorie. The firſt comprehends all the eaſt and north-eaſt ſides of the iſland; the ſecond the ſouth, weſt, and north-weſt ſides. The miniſters have 120l. a year each, excluſive of manſes and glebes. Theſe pariſhes make part of the preſbytery of Kintire, and of the ſynod of Argyle; which includes all the extent formerly under the eccleſiaſtical juriſdiction of the Biſhops of the Iſles.

The pariſh of Kilmorie has a ſeparate place of worſhip in the mouth of Clachan Burn, near Schiſkin, where the miniſter occaſionally officiates. Another place of worſhip was eſtabliſhed at Loch-Ranſa, by Ann, Dutcheſs of Hamilton, and a ſalary mortified to maintain a preacher there, which, though ſufficient at that time, is now very inadequate. It would be of great uſe to the people to have an ordained clergyman, with a more ample endowment, ſettled at Loch Ranſa.

The people are remarkably pious and devout, without ſhewing any predilection for wild and extravagant notions of religion. Each pariſh has an

eſtabliſhed ſchoolmaſter, agreeable to the law of Scotland; and there were formerly two or three ſchools eſtabliſhed by the Society for Propagating Chriſtian knowledge, but were withdrawn, from want of the requiſite accommodations: which is much to be regretted.

The Chriſtian faith ſeems firſt to have been planted in this iſland by St Molios, who was a diſciple of the celebrated St Colm, or Columba, the apoſtle of the Highlands and Iſles. One cannot read the hiſtory of this Saint, as edited by Mr Pinkerton, and more fully illuſtrated by Dr Smith of Campbelton, without being impreſſed with a belief that his conduct was not altogether ſuitable to his profeſſion, or to the tranſcendent talents with which he was endowed. Though we have only the teſtimony of an admiring diſciple, who would naturally endeavour to keep out of view every thing unfavourable to his character, yet even his narrative excites a ſuſpicion that he murdered Oran, on account of ſome unhappy difference in religious opinion. His zeal againſt women, whom he would not allow to enter his ſacred iſland, is alſo liable to ſuſpicion; when it is certain that, in his days, marriage was not conſidered as inconſiſtent with the character of a clergyman. Though he baniſhed women from his ſacred iſland, he ſeems to have kept a ſeraglio of them on a ſmall iſland adjacent, under the de-

ſignation

ſignation of a Nunnery. After he became old, he allowed his women to come to him, in his ſacred iſland, to ſave himſelf the trouble of going to them.

The traditions in Arran ſtate, that Molios, diſguſted with the irregularities of his maſter, withdrew himſelf from his ſociety, and, wiſhing to ſupport that auſterity of manners, which, though not abſolutely required in every profeſſor of Chriſtianity, he deemed indiſpenſably neceſſary in one who undertook the office of a miſſionary to convert the heathen, took up his reſidence in a cave in the iſland of Lamlaſh, from him called Holy Iſland. It appears that, after he had made numerous converts in Arran, he removed to the diſtrict of Schiſkin, where he died at the advanced age of 120.

POPU-

POPULATION.

In a country where the exiſting population fluctuates ſo much, it is difficult to aſcertain the average permanent population. The cauſes of fluctuation ſhall afterwards be accounted for. In the mean while, it is proper to ſtate all the aſcertained facts.

From the Statiſtical Account (Vol. VIII. p. 581.), it appears there were in the pariſh of Kilbride,

(1793) - - -	2545 ſouls.
The return to Dr Webſter in (1755) was - - -	1369
Increaſe	1176

From Vol. IX. p. 170, it appears there were in Kilmory - - - 3259 ſouls.

Return to Dr Webſter -	2277
Increaſe	982
Total in 1793 - -	5804
Total in 1755 - -	3646

Total increaſe from 1755 to 1793, 2158

The population of Arran was again aſcertained in 1801, agreeable to act of Parliament; and the name

name of every man, woman, and child, then residing in the island, is recorded in a book, drawn up by Mr Stevenson, factor to the Duke of Hamilton, in his own handwriting: of which the general result is, that there were then in the parish of

	Males.	*Females.*	*Total.*
Kilbride	1008	1175	2183
Kilmory	1369	1627	2996
Total	2377	2802	5179

Total decrease from 1793 to 1801 625

Neither in Dr Webster's, nor in the Statistical Account, is there any discrimination between males and females. But in Mr Stevenson's account they are accurately distinguished, and their names and ages inserted in separate columns, and summed up at the bottom of each page; of which I could only give the general result. From his statement, it appears that, in the parish of Kilbride, the females exceeded the males by 167; while, in the parish of Kilmory, the females exceeded the males by 258. Hence, the excess of females over males, in the whole island, is 425.

From all the registrations of baptisms I have perused, which are never accurate, it appears there are rather more males born in our country, than females. How, then, shall we account for 425 females

females exiſting in the iſland of Arran, without help-mates ?

Many of the young men go to ſea. Some never return ; and thoſe who do return, are never all aſſembled on the iſland at the ſame time. Hence, every enumeration of the males muſt fluctuate, and the number of females muſt always exceed that of males.

On the 6th and 7th of October 1803, the Depute-Lieutenants of the county found on the iſland 1500 men able to carry arms ; and about 500 men liable to ſerve in the Militia and Army of Reſerve. But ſuch is the averſion of the people here to the land ſervice, that they choſe to pay the penalty ; and only one or two could be prevailed upon to enter into the militia. The late Duke of Hamilton was ſo much beloved among them, on account of his kind condeſcenſion and extenſive charities, that few of them ſpeak of him with dry eyes. Yet, when he propoſed to raiſe a regiment, he was able to prevail only on a very ſmall number of them to join his colours ; and theſe were enticed by extravagant bounties. Had he propoſed to man a ſhip of the line, the people would have riſen in maſs.

The people have no other averſion to the naval ſervice, than what is common to other ſeamen, viz. the ſuperior wages given by merchants during war. Though not remarkable for gigantic ſtature, they are athletic and well ſhaped ; and, in our ſhips

ſhips of war, are diſtinguiſhed by prompt obedience, and orderly conduct.

This bent towards a ſeafaring life is not peculiar to the people of Arran; but is common to the inhabitants of all the iſlands and highlands that are contiguous to the ſea. It marks the importance of putting the fiſheries into a proper train of improvement.

I could not learn that the people here have any ſuperſtitions that are peculiar to them. The ſecond ſight has ſo long ceaſed to be known, that it now ſeems to be entirely forgotten. They ſeem ſtill to entertain a faint belief in faires, witches, and ghoſts; though even theſe ſeem to be rapidly falling into oblivion. Among the old men, there are numerous traditionary ſtories concerning Fiun and his heroes; though the poems have ceaſed to be repeated.

Mr Pennant (Tour to the Hebrides, Vol. II. p. 200.) ſays, the people in Arran bleed, with the utmoſt regularity, at ſpring and fall. That, at theſe ſeaſons, the ſurgeon makes a tour of the iſland. 'On notice of his approach, the inhabi-'tants of each farm aſſemble in the open air, ex-'tend their arms, and are bled into a hole made 'in the ground, the common receptacle of the 'vital fluid.'

I was well informed, that this ſtory was told

Mr

Mr Pennant in the way of joke; and that no ſuch practice was ever known in Arran.

So far from the health of the people being treated in this butcher-like manner, the Dutcheſs of Hamilton eſtabliſhed a ſalary to induce an able medical man to reſide in the iſland. That office has always been ably filled; and by no one more ſo than by Mr Stoddart their preſent ſurgeon.

The ſmall-pox only viſit the iſland at diſtant intervals, being brought by people from the Main-land, and prove very fatal. Dr Stoddart has made ſeveral attempts to introduce the vaccine inoculation; but the matter, which was ſent from Edinburgh, had loſt its power, and did not take effect. Other diſeaſes are few, and no way peculiar in their mode of operating.

Though moſt of the people underſtand Engliſh, many of them are baſhful, and averſe to ſpeak it. The Gaëlic appears to be a pictureſque language, and to come home to their imaginations and feelings. But, in order to ſpread the knowledge of improvement, it would be deſireable to have only one language. For this purpoſe, the clergy ſhould gradually diſcontinue their diſcourſes in Gaëlic; and the ſchoolmaſters ſhould exert all their efforts to inſtruct the youth in a knowledge of Engliſh. This recommendation I would apply to the whole Highlands and Iſles. Let us be one people, having

ing one language, the ſame laws, and ſimilar cuſtoms. In this way, and this alone, the power and proſperity of theſe kingdoms may be carried to an extent far beyond what they have yet attained.

HIS-

HISTORY.

The Gaël, a tribe of the Celts, ſeem to have inhabited the Highlands and Hebrides, from time immemorial. All our hiſtorians err in ſuppoſing, that the kingdom of Scotland had been united under one chief or monarch, from the earlieſt times, ſuch as took place at the times they wrote. So far from this being the caſe, it appears evident, that the country long groaned under the tyranny of petty chieftains in every diſtrict; and that though a ſupreme chief came ultimately to be acknowledged, he never acquired power ſufficient to maintain peace in the country, until the acceſſion of our monarchs to the Engliſh throne.

From the numerous names of places in all parts of Scotland, evidently of Gaëlic extraction, it appears that this people, at one time, inhabited the whole kingdom; and, it is probable, the whole iſland. Many theories have been advanced to account for the original peopling of the Britiſh iſles; but as they all ſuppoſe a knowledge of naval architecture, and of navigation, which certainly was not attained at the periods to which theſe theories refer, they ſeem entitled to no ſort of credit.

The

The moſt natural ſuppoſition is, that the original inhabitants of Britain came from the oppoſite coaſts of France; perhaps at a very early period, before the ſea was interpoſed between Dover and Calais. Swarm following ſwarm, and living by hunting, they would ſoon traverſe the whole iſland, and not aſſume permanent habitations, until they found their progreſs checked by the ocean.

Our old hiſtorians bring the Gaël from Egypt, or Troy. After landing them in Gallicia in Spain, where they perform a competent number of adventures, they bring them to Ireland; where, having encountered a ſufficient quantity of battles and dangers, they land them on the coaſt of Argyle; there, getting in contact, firſt with the Picts, and afterwards with the Romans, they finally prevail in expelling the one, and ſubduing the other.

To me it appears that the Picts were not a diſtinct people from the Gaël; but tribes which lay contiguous to the Roman ſtations. The practice of tattooing and painting their bodies, is common to all rude nations; and the Roman writers uniformly diſtinguiſh the inhabitants of Britain by the appellation of *picti Britanni.* As far as their conqueſts extended, they laboured to diſcourage this practice, and to introduce the Roman dreſs, manners, and arts. This occaſioned a new diſtinction between the *picti* and *non picti Britanni.* The *picti* was uſed as a term of reproach, denoting

ing barbariſm, and incivilization. But what paſſed as a term of the higheſt contempt among the tribes which had ſubmitted to the Roman yoke, was aſſumed as a title of honour, denoting national independency, and adherence to ancient uſages, by the tribes which continued to reſiſt the Roman power. It is certain that no tribe in Britain aſſumed the name of Picts, until the Roman conqueſts met with an effectual reſiſtance in the north; though it is equally certain that all the people indulged themſelves in this practice, before the arrival of the Romans. In the vulgar dialect of Scotland, *pic* denotes paint; and *pecht*, or *pechted*, denote a thing painted at this day. Theſe words are evidently derived from the Latin.

After the Romans got poſſeſſion of a great part of the low country of Scotland, they called the country which ſtill continued to reſiſt them *Caledonia*. This is, evidently, a Latin termination clapped to a word ſtill uſed in the Highlands—*Gaël-dūn*—which denotes the Gaël of the mountains, when diſtinguiſhed from the Gaël of the vallies; or, as the diſtinction has been long known in Scotland, between Highlanders and Lowlanders. The letter G in Gaëlic is pronounced ſo like C or K, that the Roman ſpelling can be eaſily accounted for.

It appears from this term, that there were then Gaël of the vallies, as well as Gaël of the mountains,

mountains, elſe the term never would have been uſed.

Within my own remembrance, the Gaëlic language extended, in many places, far beyond the barrier of the Grampians. Now, it is not uſed nor underſtood on this ſide of the Grampians; and in all points where improvements have penetrated theſe mountains, the Gaëlic has ceaſed to be known.

As the term *Pick*, or *Pict*, firſt became a national name, from being uſed as a term of reproach, ſo the name *Scot*, or *Scuit*, ſeems to be derived from the ſame origin. Of this name we hear nothing until towards the decline of the Roman power in Britain. It means a wanderer, one who lives by rapine, or, more correctly, what we would call a highwayman. It ſeems to have been applied, by the provincial Britons, as a term of reproach, to thoſe northern tribes, who made inceſſant irruptions into the territories ſubjected to the Romans, and who carried among them havock and devaſtation. But it often happens, that what is meant as a reproach by one party, is aſſumed as a title of honour by their opponents. In later times, we have an example of the word *Scot* becoming the cognomen of a gang of Border thieves. It was evidently firſt applied to them as a term of reproach; but afterwards aſſumed by themſelves as a title of honour.

The Gaël never heard of the word Scot, nor do they diſtinguiſh themſelves, or their country, by that name. They call themſelves Gaël Albinich, *Gauls of Albion*; which latter ſeems to have been the original name of the Britiſh Iſland. Nor have they the ſlighteſt veſtige of tradition among them, which points at an Iriſh extraction. On the contrary, they believe that the Celts of Ireland, whom they acknowledge to be the ſame people, having the ſame language and manners with themſelves, derived their origin from them. It appears certain that the Celts in Ireland, and thoſe on the oppoſite coaſts of Scotland, during ſeveral ages, were united in the cloſeſt bonds of alliance, and that they maintained a friendly intercourſe with each other. This intimacy ſeems to have been excited, firſt, by the attacks of the Belgæ upon the Iriſh; ſecondly, by the attacks of the Norwegians and other northern hordes upon both; and, laſtly, by the attacks of the Engliſh.

Theſe circumſtances induce a belief that the original Picts were tribes of the Gaël: That the progreſs of the Roman conqueſts towards the north, firſt ſuggeſted the neceſſity of tribes, independent before, or united by very feeble ties, ſubmitting to a common chief, in order to repel the common danger: That this paved the way for the eſtabliſhment of two monarchies, after the abſorption of ſeveral ſubordinate monarchies; the one

of

of the Picts on the eaſt of Scotland; the other of the Caledonians, afterwards Scots, on the weſt.

But, without prying into the receſſes of antiquity, where we have nothing to bear us out but uncertain traditions, obſolete monuments, and old uſages, which are now rapidly falling into oblivion; we conceive it will be admitted by all, that the Gaël of the Highlands and Iſles, have occupied their preſent ſettlements from time immemorial.

It ſeems therefore only neceſſary, as far as the iſland of Arran is concerned, to glance at the principal events which affected the iſlands in general, and this one in particular.

From Dr Barry's hiſtory of the Orkneys, we learn, that Harold Harfager, king of Norway, A. D. 870, attacked the Shetland and Orkney iſlands with a powerful fleet and army. That he utterly extirpated the Peti and Papæ, who ſeem to have been Picts, and their prieſts, who then inhabited theſe iſlands, and planted them with Norwegian colonies. He then advanced againſt the Hebudæ or Hebrides, all of which he ſubdued, including the Iſle of Mann; but does not ſeem to have extirpated the inhabitants. Our hiſtorians add, that in the treaty by which the King of Scots ceded theſe poſſeſſions, Harold inſerted a clauſe, that he ſhould have all that could be ſurrounded by boats. Taking advantage of this clauſe, he cauſed himſelf

to be carried in a boat, with great pomp, acroſs the narrow iſthmus called Tarbet, by which he claimed the peninſula of Kintyre as part of the ceded territory.

In 920, he conferred the government of all his conqueſts on Sigurd the elder, whom he created Karl, or Earl, of Orkney.

This conſtituted a ſovereignty to all practical purpoſes independent, and rather the ally, than the vaſſal, of Norway, or afterwards of Denmark. At its greateſt exaltation, the Earls of Orkney poſſeſſed the Shetland and Orkney iſles; the three northern counties of Scotland; all the Hebudæ, including the iſle of Mann; with ſeveral territories on the weſt of Inverneſs and Argyleſhires. At the ſame time, they poſſeſſed extenſive territories in Ireland. When this ſovereignty was united under an enterprizing leader, it was very formidable to the ſouth of Europe. Their undiſputed naval ſuperiority, joined to the deſperate valour of the people, at a time when ſucceſs in fighting depended more on individual ſkill and courage, than on the ſcientific tactics of their leaders, made the greateſt monarchs tremble on their thrones. Theſe iſlands were the rendezvous of all thoſe pyratical expeditions, which, during ſeveral centuries, infeſted the ſouth of Europe. They alſo furniſhed abundance of recruits for every daring enterprize. The alliance of the Earls of Orkney

was

was eagerly courted by the greateſt ſovereigns, and their forbearance bribed by the moſt munificent preſents.

But this ſovereignty contained within itſelf the ſeeds of its diſſolution. Males ſucceeded *in capita;* and when there was more than one ſon, their ſtrength was waſted in conteſts, often bloody, about the diviſion of the inheritance. Even females, or their huſbands and children, were conſidered as having an equal right of ſucceſſion with their brothers. When the inheritance terminated in females, their huſbands tranſmitted to their children a perpetual diſmemberment of the ſovereignty, which could not be reſumed by the chief of the family, until the race of the former became extinct. Had they kept the ſovereignty indiviſible, while they divided only property or effects, ſuch was the ſituation of the times, that they might have conquered a great part of the ſouth of Europe. They did eſtabliſh ſeveral permanent conqueſts, while their depredations kept all Europe in alarm. But the cauſes of diviſion ſpecified, prevented them from doing half the miſchief they otherwiſe might have done.

The Hebudæ were finally diſmembered from the earldom of Orkney, in conſequence of a diviſion of the territories among three females. The one who received the Hebudæ as her portion, married a Scottiſh nobleman; and though her

ſucceſſors acknowledged a nominal ſubjection to the king of Norway, they were more immediately connected with, and owned ſubjection to, the king of Scots, for their poſſeſſions on the Mainland.

It appears that the ſame rules of ſucceſſion, and the ſame feuds and animoſities, which had ſo often diſtracted the earldom of Orkney, prevailed in this new principality. But as they had no other hiſtorians but their Bards, or Shenachies, their tranſactions have long fallen into oblivion; nor do they ſeem to have been of ſufficient importance to deſerve remembrance.

In the thirteenth century, Alexander III. king of Scotland, claimed the Hebrides as an ancient appanage of his crown, which had been wreſted from his predeceſſors by naval power. This produced a war between him and Haco, or Hacon IV. king of Norway. Haco aſſembled his forces in the iſland of Arran, 1256; from whence, debarking on the oppoſite coaſt of Ayrſhire, he laid waſte the country with fire and ſword, while his fleet advanced along the Frith of Clyde to Largs. Alexander met his forces, encumbered with ſpoil, near Kilburnie in Ayrſhire, endeavouring to retreat on board their ſhips. He purſued them, with great ſlaughter, to Largs. Torfæus, who accompanied Haco in this expedition, claims the victory to his own party. But the teſtimony of the Scotiſh hiſtorians is confirmed by the event. Haco, with

with the ſhattered remains of his forces, returned to Kirkwall in Orkney, where he died of a broken heart. His ſucceſſor, Magnus V, perceiving his inability to defend theſe iſlands againſt the enterprizes of Alexander, ceded them by treaty, in 1266, on condition of his paying the annual ſum of one hundred marks. This is what our hiſtorians call the 'Annual of Norway,' which, though often claimed, ſeems to have been paid very irregularly, if paid at all.

Thus, theſe iſlands, after having been from 870 to 1266, disjoined, were reunited to the crown of Scotland. But their ſubjection was rather nominal than real; for their chiefs, who acquired the title of Lords of the Iſles, acted rather as independent ſovereigns than as vaſſals or ſubjects.

The Norwegian conquerors ſeem to have incorporated themſelves with the Gaël, while they poſſeſſed theſe iſlands, and to have adopted their language and cuſtoms. The only memorials they have left in theſe iſlands, are names of places from the Norſe language, and a few of their words adopted into the Gaëlic. They have alſo left many ruins of rude forts.

In progreſs of time, the Lords of the Iſles came to be diſtinguiſhed by the cognomen of Macdonnel. They often made war upon the kings of Scotland, and treaties of alliance with their enemies. When Edward I. of England advanced his claim

claim to the throne of Scotland, he found it neceſſary to attach the Lord of the Iſles to his intereſts, by treaty, and by giving him his ſiſter in marriage. The power of theſe chieftains became leſs formidable, after they were ſtripped of the earldom of Roſs, and other ample poſſeſſions on the Mainland. But the iſlands were not reduced under complete obedience to the Scotiſh crown, until James V. made a progreſs through them.

The annual of Norway had been often demanded, but evaded, or very irregularly paid, until the arrears, with the penalties for failure of payment, amounted to a very conſiderable ſum. At laſt Chriſtiern, who poſſeſſed the united crowns of Norway, Sweden and Denmark, granted a diſcharge of all theſe claims, and ſuperadded the iſlands of Orkney and Shetland, as a portion with his daughter Margaret, married to James III. of Scotland, 1469. Thus were all the iſlands contiguous to Scotland irrevocably reannexed to that crown, after they had been under the dominion of the northern nations during ſeveral centuries.

There is one ſubject of remark, and of regret, that theſe iſlands do not ſeem to have enjoyed ſo great a comparative degree of proſperity, ſince they were annexed to the Scotiſh crown, as they did while they were independent. The fiſheries are an inexhauſtible ſource of wealth and population, thrown around them by the hand of Nature.

Though

Though ſeveral of our kings proſecuted the improvement of the fiſheries with great ardour, and no inconſiderable ſucceſs, they were too often in captivity, or minors, to allow time for any plans to operate their full effect.

Having hinted at the principal occurrences which affected the iſlands in general, we ſhall preſent a few ſhort notices connected with the Iſland of Arran in particular.

The circumſtances reſpecting the reſidence of King Robert Bruce in Arran, as far as they can be collected, are as follow.

This hero had aſcended the throne of his anceſtors at Scone, 27th March 1306. The Counteſs of Buchan, ſiſter to the Earl of Fyfe, in the abſence of her brother, claiming an ancient privilege of her family, actually placed the crown upon his head.

But the ſmall party which adhered to Bruce was ſoon routed and diſperſed, by the Engliſh forces ſtationed at Perth. Bruce, with the diſpirited remains of his party, retired into the wilds of Athole. He afterwards made an irruption into Aberdeenſhire, where he met his wife, and the wives and female relatives of his followers, all determined to ſhare the fortunes of their huſbands, their fathers, and brothers. At the approach of the Engliſh, they again ſought refuge among the mountains, and, accompanied by their faithful women,

women, reached Breadalbine. They were attacked and defeated by Alexander of Argyle, the Lord of Lorn, who had married the aunt of Comyn, and was eager to revenge the ſlaughter of that chief. Bruce covered the retreat of his ſmall party, and checked the purſuit of his enemies. They had hitherto ſubſiſted by hunting and fiſhing; but winter approaching, Bruce ſent his queen, and the other ladies, with all his horſemen, to the caſtle of Kildrummie in Marre: himſelf, with two hundred men, reſolved to force a paſſage into Kintyre, and from thence to croſs into the northern parts of Ireland.

After encountering incredible hardſhips, and being often reduced to the laſt extremity of famine, Bruce, with a few faithful companions, reached Rachrin, an iſland on the northern coaſt of Ireland. Here he remained during the winter; and his enemies ſeem to have imagined him to be either dead, or ſo completely humbled, that he was no longer formidable.

At the approach of ſpring, however, he ſecretly paſſed over into the Iſland of Arran. He is ſuppoſed to have landed at King's Cove, and to have reſided there, ſubſiſting by hunting and fiſhing, until he could ſound the inclinations of the natives towards his cauſe.

How long he remained here is uncertain; but it is a fact that ſeveral natives of the iſland afterwards

wards obtained from him grants of lands, for ſervices they had rendered to him while here, or while they followed his fortunes.

The learned and accurate Lord Hailes, in his Annals of Scotland, relates the manner of his eſcape from Arran rather differently from popular tradition. Tradition ſays, that the king himſelf went over, in a ſmall boat, to the oppoſite ſhore of Carrick, to ſound the diſpoſitions of the people, and to rouſe the vaſſals of his houſe. That in the diſguiſe of a minſtrel, he inſinuated himſelf into the good graces of the Engliſh forces, who occupied the caſtle of Turnberry, and places adjacent, and found they might eaſily be ſurpriſed; but his vaſſals had loſt all hope of effectual reſiſtance. He had agreed, if he found matters favourable, to cauſe a fire to be lighted on a certain hill oppoſite to Arran, which was to be the ſignal for his followers to paſs over to him. But it happened that ſome boys had raiſed a blaze of peas, a practice formerly very common in Scotland, near the place agreed on, which brought over his men from Arran. The king met them on the coaſt of Carrick, explained the cauſe that had miſled them, and informed them that his fortunes were utterly deſperate.

Lord Hailes ſays, that Bruce ſent a confidential meſſenger to ſound the diſpoſitions of his vaſſals, with inſtructions, if he found them favourable, to make

make a ſignal on a day appointed, by lighting a fire on an eminence above the caſtle of Turnberry.

'The meſſenger found the Engliſh in poſſeſſion of Carrick; Percy, with a numerous garriſon at Turnberry; the country diſpirited, and in thraldom; none to eſpouſe the party of Bruce, and many whoſe inclinations were hoſtile.'

On the day appointed, Bruce anxiouſly watched the expected ſignal. In the afternoon he ſaw the welcome fire, and immediately embarked with his followers. Night ſurpriſed them on the ſea; but, conducting themſelves by the fire, they reached the ſhore. Here they met the meſſenger, who reported there was no hope of aid. 'Traitor!' cried Bruce, 'why did you make the ſignal?' 'I made no ſignal,' replied he; 'but obſerving a fire on the eminence, I feared it might deceive you, and I haſted hither to warn you from the coaſt.'

If there be any truth in the tradition, that the fire was occaſioned by burning peas in the ſtraw, it will ſerve to mark the period of the king's reſidence in Arran. It is probable he came there about the beginning of March, and paſſed over to Carrick about the cloſe of harveſt. As the nights would now be getting long, with frequent fogs, this ſeaſon would be the moſt favourable of any for ſurpriſing his enemies with a handful of men.

Bruce

Bruce now ſaw he could not return without being obſerved, and the place of his retreat diſcovered. He therefore reſolved to obey the dictates of valour and deſpair, and to perſevere in his enterprize.

Never was enterprize undertaken in ſuch hopeleſs circumſtances. Moſt of the ſtrong holds of Scotland were garriſoned by Engliſh troops. The greateſt part of thoſe who had declared for him at his coronation had been impriſoned, or executed as traitors. His wife had been betrayed into the hands of Edward; and the heroic Counteſs of Buchan, who placed the crown upon his head, was exhibited in a cage at Berwick, a ſpectacle of deriſion to the populace. The nobles had ſworn fealty to Edward, acknowledged his right to the crown of Scotland, and were moſtly ranged under his banners. Thoſe who had ſhewn a partiality for Bruce had been forfeited, and their lands conferred upon Engliſh ſettlers. The numerous adherents of John Comyn entertained a perſonal hatred againſt Bruce, and were zealous to revenge the death of their chief. The party of Baliol, though numerous, had loſt much of their attachment to him, on account of his puſillanimous reſignation of his rights to the Engliſh monarch; yet they were all profeſſed friends of Edward, and enemies of Bruce. The pope, too, whoſe curſes in thoſe days were more formidable than embattled

tled armies, at the inſtigation of Edward, had ſolemnly excommunicated Bruce, and all who adhered to him, for the ſlaughter of John Comyn in a church.

Though fortune ſtill continued to perſecute Bruce, yet, by heroic courage and perſeverance, he ultimately ſucceeded, and, by the battle of Bannockburn, eſtabliſhed the independence of his country. He did more. By wiſe and ſalutary laws he civilized, and by a vigorous adminiſtration he promoted the proſperity of that country which he had reſcued from oppreſſion.

At a ſubſequent period, the Lord Boyd, abuſing the influence he had acquired during the minority of James III. cauſed his ſon Sir Thomas Boyd to be married to the king's eldeſt ſiſter, 1467. This lady had been affianced, during her infancy, to the ſon of Henry VI. of England; and ſhe is ſaid to have been afterwards promiſed to the Lord Hamilton. Boyd cauſed Arran and other lands to be erected into an earldom, and conferred as a marriage-portion with the lady. On the fall of the Boyds, this princeſs was ſo much attached to her huſband, that ſhe fled with him to Denmark. Her brother contrived to fetch her home, and cauſed her to be divorced from Boyd. She was afterwards married to the Lord Hamilton, 1474; but ſeems not to have conſented to this match, until ſhe heard of her firſt huſband's death.

By

By this marriage the Hamilton family acquired the earldom of Arran; and, during the minority of Mary, became next in ſucceſſion to the crown of Scotland.

From Douglas's Peerage, p. 326, we learn that the Hamilton family are deſcended from the Earls of Mellant, a great and noble family in Normandy; that they came over with William the Conqueror, to whom they were nearly related; and, for great ſervices in the battle of Haſtings, were by him rewarded with many ample poſſeſſions, and became Earls of Leiceſter in England. They derived the name of Hamilton from the manor of Hambleton in Buckinghamſhire, where they chiefly reſided. They firſt came to Scotland, 1215, in the reign of Alexander II., who conferred many favours upon William, third ſon of Robert, the third Earl of Leiceſter. From Malcolm Kenmore downwards, it was the invariable policy of our kings to encourage people from more civilized countries to ſettle in Scotland. When England was convulſed by civil wars, the loſing party always found an aſylum and protection in Scotland. From this policy, the language and manners of great part of the country were gradually changed; and many of our greateſt chiefs, ſuch as the Hamiltons, the Gordons, the Sinclairs, the Fraſers, &c. &c. are either of Saxon or of Norman extraction. The illuſtrious King Robert Bruce con-

ferred the barony of Cadzow (afterwards called Hamilton), and many other poſſeſſions, on Sir Walter de Hambleton, for heroic ſervices in his wars with the Engliſh. The family continued in great favour with ſucceeding monarchs, until they became princes of the blood, and heirs apparent to the crown of Scotland; as already narrated.

Having preſented theſe ſhort hiſtorical gleanings relative to Arran, it only remains to be mentioned, that ſuch monuments of antiquity as occur, ſhall be deſcribed in the progreſs of the enſuing Geological Survey.

SOILS AND MINERALS.

These are claſſed together, becauſe ſoils are formed from the decompoſition of rocks, and contain a greater or ſmaller proportion of animal and vegetable matters mixed with the mineral ſubſtances which have been worn from the rocks. Soils are either primary, or ſecondary. The primary ſoils cover the rocks, from whoſe decompoſition they have been formed; and their fertility commonly depends on their degree of depth, the proportion of animal and vegetable matters, or the quality of the rocks whoſe decompoſition forms their baſis. The ſecondary, or alluvial, ſoils, have been conveyed into their preſent ſituation by water. They commonly contain a greater proportion of vegetable matter; and unleſs where they are chiefly compoſed of ſand or rounded ſtones, are commonly more fertile than the primary ſoils. But this depends much on the quality of the rocks from which the alluvial ſoils have been waſhed: for primary ſoils on whinſtone rocks, which often contain portions of carbonate of lime and of iron; and ſoils on limeſtone rocks, not overcharged with carbonate of lime, are often more fertile than al-

luvial ſoils. The moſt frequent defect of thoſe ſoils is want of ſufficient depth.

ARRAN CASTLE, GOATFELL *, &c.

Arran Caſtle is ſituated on a rocky bank, which riſes from the north ſide of the Bay of Broddick. This bank is part of a peninſular elevation, or ſhoulder, projected from the baſe of Goatfell.

The original part of the caſtle conſiſts of a large, high and maſſy quadrangular tower, whoſe internal accommodation, and external gloom, lead the mind to reflect on thoſe diſorderly times, when a baron, though immured within battlements that ſeemed impregnable, ſeldom cloſed his eyes at night without apprehenſion that his throat might be cut before morning. From this tower certain buildings have been detached towards the weſt, which, though ancient, are of a more recent date. The late Dutcheſs Ann built a modern houſe on the ſouth ſide of the caſtle, and did much to improve the accommodation of all the buildings connected with it.

On

* The Gaëlic name of this mountain is *Gaodh Bhein, mountain of winds;* and the name *Goatfell* has been impoſed on it by the *Saſſanoch*, or ſtrangers, who have viſited the iſland. There is a groſs abſurdity in calling it *Goatfield;* the laſt ſyllable denoting a level plain, to which it is a complete contraſt.

On the ſouth ſide of the caſtle, a large ſquare area is ſurrounded with a high and very thick wall, ruinous in ſeveral places. This wall is faced with a parapet, having embrazures for wall-guns, or other projecting engines; and includes all the ſtables and out-houſes of the caſtle.

To the north ſide of the caſtle, Oliver Cromwell added an angular baſtion. It conſiſts of an elevated bank of earth, included within walls of great thickneſs and ſtrength, and paved above with maſſy hewn flags, ſloping ſo as to throw off water like the roof of a houſe. Above theſe flags a high parapet riſes, having three embrazures towards the bay, and three towards the country; ſo that their artillery might either prevent landing in the bay, or ſcour the country.

In this caſtle Cromwell is ſaid to have placed a garriſon of eighty men. But, having nothing to do, they made excurſions through the country, uſed freedoms with the women, and otherwiſe provoked the inhabitants ſo much, that they roſe upon them when they were all out of the caſtle, and ſlew every one of them.

The caſtle ſeems to have been built of red ſandſtone, quarried from a ſpacious hollow on the land ſide, which a copious ſpring might ſtill convert into a broad and deep moat, ſo as to cut off all approach to the caſtle from the land, except by a narrow neck, expoſed to the guns of the baſtion.

On this neck there is reaſon to think that a draw-bridge formerly ſtood, though the gap is now filled up with earth.

The Danes are ſaid to have had a place of ſtrength here, when they occupied this and the other Hebridian Iſles, and many other ſettlements on the mainland Highlands. But, from the monuments of their architecture which they have left in other places, I do not think that a ſingle ſtone, even of the original tower, was placed by them. Its date, therefore, though ancient, muſt be poſterior to the occupancy of the iſland by the Danes. This caſtle has long been the occaſional reſidence of the Dukes of Hamilton, when they viſit their property in Arran; and, in their abſence, it is inhabited by their ſteward.

The land around is laid out in ſquare enclo-ſures, interſected by belts of trees; and towards the north there are extenſive natural woods. The ſoil is moſtly a red, friable clay, formed from the decompoſition of red ſandſtone and ſhiver; and, where of ſufficient depth, is not unfertile. Above the cultivated land, the ſummit of the ſhoulder appears clad in gloomy heath, over which the ſullen majeſty of Goatfell frowns. It may be from three to four hundred feet of elevation above the level of the ſea. It would add much to the beauty of this place, were this elevated tract of land cloth-ed in lively green. The horrid aſpect of Goatfell,

ſcowling

ſcowling over a green declivity, projected from his baſe, would form a ſurpriſing contraſt between the ſublime and the beautiful. *

The ſtrata expoſed in Merkland Burn, on the north, are moſtly red ſandſtone †, and ſometimes white. Theſe are every where interſected by baſaltic or whinſtone veins, which often alter the poſition of the ſtrata. Theſe ſtrata frequently alternate with red ferruginous clay or ſhiver ‡. In one place, a ſtratum of red clay included nodules of limeſtone; but the quantity ſmall. Theſe ſtrata aſſume a higher angle as we aſcend the burn; and they are intercepted by ſtrata of Molaris ‖ and Breccia, or coarſe puddingſtone. Behind theſe, what is commonly called baſtard freeſtone, or rubble ſtone, arranged in perpendicular ſtrata, occurred. This is cut off by a vein of micaceous ſchiſtus, behind which, the Blotta § of Dr Walker, but which I ſhall call primary breccia or pudding-

* Lord Kaimes praiſes Inverary caſtle, becauſe it aſſimilates with the rugged mountains among which it is placed; which is like the frog affecting to emulate the ox. In ſuch caſes, our greateſt pleaſure ariſes, not from ſimilitude, but from contraſt, when we find an elegant manſion in a rugged country where we did not expect it.

† See Note [A.]

‡ See Note [B.]

‖ See Note [C.]

§ See Note [D.]

ſtone, is the only rock expoſed to view in this direction, until we reach the baſe of Goatfell.

Behind Arran Caſtle, there is a very large ſtratum of limeſtone, which paſſes down to the valley below. It ſtands at an angle of 45°, and conſiſts of quadrangular blocks, imbedded in ſtratulæ of red clay marl. It is covered by a ſtratum of white ſandſtone, and the working of this quarry has been abandoned, becauſe the roof falls in, and endangers the workmen. I am inclined to think it had better be wrought by a mine, led up through the ſtratum, from the valley below. The limeſtone contains numerous ſhells, chiefly large oyſters and clams, though no ſuch ſhell-fiſhes are known to exiſt in the neighbouring ſeas.

Near the top of the hill, above the plantations, another very large ſtratum of limeſtone occurs, every way ſimilar to the former, except that it makes a higher angle with the horizon. Its working has alſo been abandoned, becauſe, being covered with a vaſt maſs of clay marl, expoſure to the air cauſes this to moulder down, and to cover the face of the quarry.

Were the heath burnt, and ruts cut with the plough to diſcharge the ſuperficial moiſture of the neighbouring waſte, this clay marl, or lime, ſpread upon the ſurface, would cauſe it to throw up ſweet herbage, and produce the lively contraſt with the gloomy aſpect of Goatfell, already deſcribed.

After

After traverſing an extenſive tract of moor and moſs, we arrive at the baſe of Goatfell, where the firſt viſible rock is what is commonly called *grey granite.* *

Aſcended by the ſhoulder which is projected eaſtward from the body of the mountain. Found this ſhoulder to be perpendicular on the north, and compoſed of vaſt blocks of granite, placed upon each other with conſiderable regularity, ſo as to reſemble an immenſe wall, which the ſtrata on the ſouth reſpected, like tiles placed on the roof of a houſe. Found another ſimilar wall, running at right angles to this, or nearly from ſouth to north; and their point of contact is the ſummit of Goatfell. Thus this mountain is compoſed of three ſhoulders, in the form of a T; and the lofty pinnacle at their junction forms his ſummit.

On looking round, the mind was loſt in aſtoniſhment at the terrific grandeur of the ſcenery, and was forcibly led through Nature up to Nature's God. No ſoil, but patches of mooriſh earth interſperſed amidſt naked blocks of granite. Deep and gloomy chaſms, apparently doomed to eternal ſterility and ſilence, except when the latter is interrupted by the loud roar of the torrent, or the fury of the tempeſt; the precipitous ſides, and ragged ſummits of the ſurrounding mountains, freezed

* See Note [E.]

freezed the ſoul with horror, mixed with pious admiration.

I could not help remarking how much the buildings of the Almighty frown contempt on thoſe of man. To ſuperficial obſervers, the latter may appear more regular; but the former ſurpaſs in magnitude and grandeur, and, amidſt apparent diſorder and confuſion, poſſeſs a regularity the moſt exquiſite, which we may admire, but never can fully comprehend.

A hazineſs in the lower regions of the atmoſphere, confined our proſpect to a glimpſe of Cowal, of Kintyre, the Rock of Ailſa, Ayrſhire, Bute, and the ſurrounding ſeas.

Though this mountain overlooks three kingdoms, Mr Playfair (*Illuſtration of the Huttonian Theory*, *p.* 314.) ſuppoſes its height to be nearly 3000 feet; and the late Mr Gerſham Stewart (*Statiſtical Account of Scotland*, *vol. VIII. p.* 580.) makes its height to be 2840 feet above the level of the ſea. The latter is probably the reſult of a barometrical meaſurement by the late Mr Burrel. Hence, this mountain does not poſſeſs a height proportioned to the extent of ſurface of which it commands a view.

The granite of which the mountain is compoſed conſiſts of cryſtallized fell-ſpar, commonly of a white or gliſtening colour, when freſh broken; though, in many caſes, the fell-ſpar exhibits a red-

diſh

diſh brown, or ruſty appearance, eſpecially where the ſtone is undergoing decompoſition. Among the fell-ſpars, ſilicious cryſtals are interſperſed, in various proportions, and of various ſizes. Theſe commonly terminate in a pyramid of five ſides; and are more or leſs of a dark or ſooty colour. A ſmaller proportion of talk enters into the compoſition of this granite, than is commonly found in granite of the ſame ſpecies; and it ſometimes exhibits ſmall cryſtals of ſchorl, of a black colour.

Many blocks, and parts of blocks, eſpecially near the ſummit, conſiſt of granite of ſo ſmall a grain, that they may eaſily be miſtaken for ſand-ſtone. The other parts are of large grain; and the fell-ſpar, in quantity, far exceeds the other ingredients.

The whole mountain is ſtratified, in many caſes, with conſiderable regularity, though frequent troubles, or confuſions, in the ſtrata, occur. In the hollow between the eaſtern and ſouthern ſhoulders, where the ſtrata are expoſed by a burn, when the aſcent happens to be gradual, the ſtrata do not riſe at a very high angle; but when the aſcent is more abrupt, the ſtrata riſe at a proportionally higher angle. On the ſouthern ſhoulder, where the aſcent is very abrupt, the ſtrata riſe at an angle of about 80°, or approach to the vertical poſition,

poſition, eſpecially in the arm which projects northward from the ſummit.

The riſe of the ſtrata is towards the wall of huge blocks, already deſcribed, on each ſide; but, on the one ſide, the riſe is much more abrupt than on the other. This ſeems to have occaſioned the ſtrata on the abrupt ſide to fall down, forming thoſe frightful chaſms, to which we look down with diſmay; and leaving a great depth of the wall, or vein, expoſed to view, by which we obſerve it to be compoſed of blocks of various, but moſtly of enormous ſize, arranged in the form of ſtrata, which here ſeldom deviate much from a horizontal poſition.

The ſtrata are interſected by two ſets of perpendicular cracks, running parallel to each other, and nearly in ſtraight lines.

The one ſet, at various, and unequal diſtances, run in the direction of the riſe of the ſtrata. The other ſet, at conſiderable, and apparently equal diſtances, croſs the former at right angles.

The effect of theſe cracks is to form the ſtrata into blocks of various dimenſions, correſponding to the diſtance between one ſet of cracks, and the thickneſs of the ſtrata, which varies conſiderably. The figure of the blocks is parallelopiped, or rhomboidal, according to the angle of elevation at which the ſtrata encounter a crack.

Similar

Similar cracks are found in ſtratified ſandſtone, called by workmen *ſlips*, *cutters*, or *backs*; and they commonly divide the ſtrata into rhomboidal blocks. They ſeem to have been produced by the ſhrinking of the ſtone in the inſtant of its conſolidation.

Some detached blocks are ſeen, of from three to four feet ſquare, and from fifteen to twenty-five feet long. But in ſome of theſe, ſmaller cracks, not viſible in thoſe that remain in their original ſtate, may be diſcovered. Had there been no other but the great and viſible cracks, the blocks ſhould have been from forty to fifty feet long. Some detached blocks, of vaſt ſize and irregular figure, alſo appear on and near the ſummit. Theſe may have belonged to the ledge or vein which forms the ſummit, and is projected from it in the three directions already deſcribed. A ſimilar ledge or vein, though of ſmaller dimenſions, runs from eaſt to weſt, and is viſible where the burn forms a caſcade near the baſe of the mountain.

Diſintegration ſeems to commence in theſe rocks, by the inſinuation and freezing of water, in the ſmaller cracks already deſcribed, which ſubdivides the large blocks into ſmaller pieces. Expoſure to the weather produces decompoſition in the fell-ſpar, and diminiſhes the adheſion of its cryſtals. This admits water, which freezing, cauſes them to fall off in concentric layers. This cauſe

operates

operates moſt powerfully on the ends and angles of the blocks, where I often found a layer ſeparated from the ſolid ſtone, and the adheſion of the cryſtals ſo far diminiſhed, that I could crumble them in pieces by the hand. Hence, except where they are defended by a hard vein of quartz, the angles are perpetually reduced, and the ſtone acquires a conſiderable degree of rotundity, before it is ſo far undermined, as to roll down the mountain.

Deſcending by the ſouthern and ſteep ſhoulder of the mountain, ſaw, at the head of the hollow where the deſcent begins to grow leſs rapid, a parallelogramic maſs of granite, of vaſt dimenſions, and about fourteen inches in thickneſs, placed in a horizontal poſition, like the floor of a houſe. This could not have happened from its accidentally ſliding down the mountain; becauſe, though I did not ſee on what the ſide next the mountain reſted, it was elevated above the heathy ſurface, and the oppoſite ſide reſted on two thin granites, ſituated near its angles, and placed on edge. In front, it is ſo high that people may eaſily ſhelter themſelves under it. Several rounded blocks are ſituated below, though it reſts on none of them; and they ſeem to have been uſed as props in the progreſs of elevating the ſtone. I ſuppoſe this may have been a Druidical altar, or place where religious ceremonies were performed, to which the awful

awful grandeur of the ſurrounding ſcenery would give great effect.

Below this, ſeveral copious ſprings burſt out, which, gradually collecting, form a burn. Found the heat of one of theſe ſprings to be 46°, which is probably the medium temperature of the mountain.

Where the granite rocks ceaſe to be viſible, this burn is joined by another ſtream, and they run a long way through a level ſurface, that is encumbered by huge rounded maſſes of granite.

At the head of Knockin Glen, a very large vein of ſhattery priſmatic whinſtone *, of a dark blue colour, is firſt ſeen to interſect the ſtrata. Below this, a very irregular ſpecies of micaceous ſchiſtus † occurs, arranged in ſtrata, that are nearly perpendicular, and variouſly bent. In many parts, it contains nodules, or veins, of quartz, round which the ſtratulæ are curiouſly bent and contorted. Further down, whinſtone again occurs;

* The late Rev. Mr Ure (Hiſtory of Rutherglen and Kilbride, p. 268.) thinks, 'That the Scottiſh term *whin*, is 'frequently, in common language, made uſe of to expreſs any 'thing that is hard, ſharp, and prickly. According to this 'meaning, the whinſtone ſignifies one, the fragments of which 'have ſharp and prickly corners. The word taken in this peculiar ſenſe, is equally ſignificant with any name, as yet given 'to this claſs of ſtones, from the Greek, German, or Engliſh languages.'

† See Note [F.]

curs; and below this, Rubble ‡ or baſtard freeſtone, is ſeen, arranged in vertical ſtrata. It is moſtly of a red colour, of various intenſity; though ſome ſtrata are whitiſh, or grey. Towards the bottom of the glen, the Rubble graduates into the common red ſandſtone.

‡ See Note [G.]

GLEN ROSA, SHIRREG, &c.

SOUTH of Arran Caſtle, a beautiful valley, called Glen Shant, or Valley of Enchantment, about a mile in every direction, extends from the head of Broddick Bay. From the head of this valley, Glen Roſa extends about five miles towards the north-weſt, and Glen Shirreg is projected towards the weſt, being ſeparated from each other by a ridge of hills. The ſtreams which flow from theſe glens, form a junction near the mouth of Glen Shirreg, and, taking a ſweep along the ſea-beach, form an incommodious harbour for boats at the head of the bay.

There is reaſon to believe that this bay formerly extended much further within land than it does at preſent, if it did not even penetrate a conſiderable way into Glen Roſa; but the valley has been formed by ſtones and earth waſhed down from the neighbouring mountains. The ſoil is moſtly a reddiſh friable earth, in ſome parts too much encumbered with ſtones, where it is only adapted for planting. Towards the ſea-beach it is very ſteril, being moſtly compoſed of granitic ſand, conveyed by the Roſa, and beat back by the ſea. In ſeveral

parts, draining would recover excellent ſoil; and much good land might be gained by extending cultivation along the riſing ground on the north.

In ſeveral places there are heaps of ſtones, which I take to be ancient cairns, piled upon the aſhes of the dead. In two places there are tall obeliſks, which are ſuppoſed to be monuments on the graves of heroes. But I take them to be remains of Druidical circles, or places of worſhip. A more entire circle of this ſort is ſeen on the riſing ground at the mouth of Glen Shirreg, towards the weſt; and a maſſy obeliſk, perhaps the remains of a circle, is ſeen in Broddick wood, towards the ſouth.

Glen Roſa firſt exhibits Rubble ſtone, in ſtrata nearly perpendicular, being a continuation of that in Knockin-burn, occupying the lower hills, on each ſide, at the mouth of the valley. This is cut off by a line running nearly from ſouth to north; where the micaceous ſchiſtus commences, and is continued a conſiderable way up each ſide of the valley. The ſtrata of this alſo ſtand almoſt perpendicular, and are cut off by a line nearly parallel to the former; beyond which granite commences.

The valley firſt becomes encumbered with maſſes of the ſchiſtic rock; and afterwards with more numerous, and often moſt enormous, maſſes of granite.

The

The ſtrata of granite, though their angles of elevation be very various, always approach more to the horizon, than any of the two former. Hence, it is impoſſible to aſcertain whether the two former ſtrata reſt upon each other, or on the granite; for they ſeem to reſt only on themſelves: and the rotundity and inferior altitude of the hills which each compoſes, ſeem owing to their more rapid decompoſition.

The firſt granite *in ſitu*, that occurs in the bottom of the Roſa, is where a burn from the ſouthern ridge forms a junction. Here it is regularly ſtratified at an angle of about 30°; and a granitic vein, moſtly compoſed of vaſt blocks, interſects the ſtrata, in a direction from ſouth-weſt to north-eaſt. Another granitic vein, nearly in the ſame direction, compoſed of vaſt blocks built upon each other like a perpendicular wall, interſects the ſtrata further up the burn, and cauſes a ſudden elevation of the ſtrata below; while thoſe above, for a great way, are rendered almoſt horizontal. A third vein, moſtly compoſed of fatiſcent granite, with a few ſolid, though ſmaller blocks behind, occaſions a ſimilar change in the angle of elevation of the ſtrata, though not to ſuch an extent as the former. All theſe ſtrata have two lines of riſe, and their average is from north and by weſt, to north-weſt.

The granite on the ſouthern ſide of Goatfell, which bounds the glen on the north, and on the

ridge oppoſite to it, which bounds it on the ſouth, though it has one line of riſe pointed northward, has its general elevation towards the oppoſite tops of the mountains; and, viewed from the glen, appears like tiles placed on the ſteep roofs of two oppoſite houſes. Above theſe tiles a perpendicular wall is ſeen at the ſummit of each ridge, reſembling a wall built up through the centre of a houſe, on which the roof had reſted, but part of which wall had been uncovered by the fall of the upper part of the roof.

I am hence inclined to think, that theſe veins, compoſed of vaſt blocks, placed upon each other in nearly a horizontal poſition, had been firſt formed; and that the cryſtallization, or the conſolidation of the other ſtrata, had commenced at them. The ſolid edges of theſe new formed ſtrata, reſting on the veins, the remoter parts would fall into an inclined poſition in proportion as they were conſolidated from the liquid (whatever it may have been) in which the matter had been ſuſpended. The cryſtallization of ſome ſalts, which require ſticks, or threads, interſperſed through the liquor, on which the conſolidation may commence, forms a ſort of illuſtration of the views here exhibited.

I am hence inclined to reckon the vaſt blocks which encumber the ſummit of Goatfell, and his projecting ſhoulders, as part of the vertebræ (if we may be allowed the expreſſion) of the mountain;

tain; and the ſmaller veins projected from them in various directions, to reſemble the ribs, or ſmaller bones. The formation of the other ſtrata around theſe, has occaſioned all that variety in the line and angle of elevation which diſtinguiſhes the ſtrata of granitic mountains.

Though the ſtructure of the granitic veins is not always ſo regular as it is here deſcribed, yet, in general, where ſeen *in ſitu*, they conſiſt of blocks of various ſize, but many of them immenſe. Theſe are built upon each other with conſiderable regularity; their lines of ſeparation are regular, and always deviate ſomewhat from the plane of the horizon. The other ſtrata deviate much more violently from the horizontal plane; many ſections of them, though very broad, are of inconſiderable thickneſs; and the thickeſt, though they often furniſh blocks of great length, are far from being ſo maſſy as thoſe furniſhed by the veins.

To prevent unneceſſary repetitions, I have thrown together theſe general obſervations, which I had made on the ſtructure of other granitic mountains; but the deep chaſms which interſect thoſe of Arran, expoſe their ſtructure more fully to view than any others I had obſerved. A ſimilar ſtructure I have ſometimes ſeen in ſtrata of ſandſtone; and whether the cauſes here aſſigned be well or ill-founded, the facts are open to obſervation.

At a caſcade where the Roſa has cut a deep channel, a vein of fatiſcent whinſtone, about twelve feet thick, croſſes it; and then, ſuddenly turning, follows a zig-zag direction along the bottom of the burn. On the north ſide of the caſcade, where this vein comes out to the ſurface, it is decompoſed into a dark-coloured earth. The other parts conſiſt of nodules of a dark blue whinſtone, imbedded in a ſofter matter, which is formed from the decompoſition of the nodules in concentric layers. The caſcade, and the deep chaſm, have been formed from the water having ſcooped out the whinſtone vein.

But what ſtruck me moſt, was two veins of granite, ſtanding perpendicular, and parallel to each other, and inſerted exactly in the centre of the whinſtone vein, in the bottom of the chaſm. Great part of theſe granitic veins muſt have been ſwept away by the water; but the fragments which remain are of conſiderable breadth, and ſtand about four feet above the ſurface of the pool. They are each about four inches in thickneſs, and are ſeparated by about two inches of whinſtone, of the ſame ſpecies with the reſt of the whinſtone vein.

The granite, of which theſe veins are compoſed, is extremely compact: its freſh fracture is white, with a gliſtering appearance, like rhomboidal ſpar of lime; exhibits no ſilicious cryſtals, but only

fell-

fell-ſpar, with very thin laminæ of talk, of a dark colour, interſperſed.

The ſides of the chaſm are compoſed of broad and maſſy quadrangular blocks of granite, leaning, at a ſmall angle, towards the mountains on each ſide. The granitic ſtrata being pretty regular above and below this place, I am inclined to regard theſe blocks as part of a primary vein, croſsing from mountain to mountain; only the blocks, in place of being arranged horizontally, like thoſe I have deſcribed, ſtand almoſt perpendicular.

Towards the lower part of the chaſm, the whinſtone vein paſſes under the granite, and the ends of the blocks are ſeen to reſt upon it. Here it either terminates, or continues its progreſs under the granite; becauſe it is no where ſeen at the ſurface beyond this.

At the head of Glen Roſa, the burn divides into two branches. One from the weſt comes down from a deep hollow, emboſomed in the granite mountains. The other, from the north, deſcends from an elevated ridge, interpoſed between this and Glen Iorſa *. In this ridge the ſtrata continue to be pretty regular; and the ſudden elevation is cauſed by numerous croſs veins, conſiſting of large blocks, arranged in nearly a horizontal poſition, as formerly deſcribed. Theſe

* Pronounced *eerſa*.

interſecting the inclined ſtrata, cauſe numerous caſcades in the burn, and prevent the latter from being ſwept away.

In many of the inclined ſtrata in Roſa burn, eſpecially towards the lower parts, I obſerved rounded blocks, and nodules, of various ſpecies of ſtones, inſerted in the granite. Theſe were of various ſhapes and ſizes; but all of them more or leſs rounded and water worn. Some contained various concretions, inſerted in a ſandy ſubſtramen. But moſt of them exhibited a bluiſh, or greeniſh grey, appearance on the outſide; their fracture jaſpidean, white, and ſparkling; but afterwards reſumes the outſide colour. Theſe ſeem to be compoſed of very ſmall particles of quartz, inſerted in a clay ground.

The granite was uniformly moulded around theſe blocks, or nodules, the hollow taking their exact ſhape; but nowhere adhered to them. So far from this, where there was no projecting part of the ſtone, over which the granite had cloſed, they could eaſily be picked out.

Theſe concretions are very different from the ſmall-grained granite on the ſummit of Goatfell; for, though the latter fills up hollows, or makes part of a block, it is never water-worn, and always adheres firmly to the block of which it makes a part.

Having

Having obſerved ſimilar phenomena in other granite rocks, I drew a concluſion, that the diviſion of mountains into primitive and ſecondary, was without foundation; that mountains are primary and ſecondary only in a relative ſenſe, as it reſpects the time of their progreſſive formation; but that none are primitive in an abſolute, unconditional ſenſe. In granite mountains, I never obſerved any remains of organized bodies; and hence concluded, that their formation had preceded the exiſtence of animals and vegetables. But the blocks and nodules here alluded to, muſt have made part of rocks which exiſted before the granite was formed, and, during the formation of the latter, were encloſed within its ſtrata.

Through Glen Shirreg, a road, or rather tract, conducts to the oppoſite ſide of the iſland; and a good road might eaſily be made in this direction. The hills on each ſide are moſtly compoſed of red ſandſtone, interſected by numerous veins of whinſtone; the ſoil chiefly a red, friable clay. The ſouthern ridge exhibits terraces riſing above each other, where a little draining might improve the paſture, or much land might be added to cultivation. This ridge terminates in hills of primary puddingſtone, which here occupy the ſummit of the iſland.

Below the farm-houſes at the mouth of the glen, a large body of red clay marl, mixed with ſmall

ſmall ſtones, is expoſed by the burn. This might prove an excellent corrective of the defects of the ſoil above it, and of others contiguous, which are either ſand or gravel.

Near the ſummit of the ſouthern ridge (called *Broddick*, or *hill of gentle riſe*), a very large, and nearly vertical ſtratum of limeſtone, is ſeen running below a ſtratum of white ſandſtone. This limeſtone is every way ſimilar to thoſe already deſcribed; and a ſtratum of red marly ſhiver, between it and the ſandſtone, exhibits numerous ſpecimens of various ſea ſhells. The limeſtone has been partially wrought in various places; but has been abandoned, by reaſon that the falling of the freeſtone ſtrata endangered the workmen. I am inclined to think that mining would prove the eaſieſt and ſafeſt way of working it.

Many large rounded maſſes of granite are ſcattered over this ridge; though there are no granite rocks, in this direction, from which they could roll.

On the northern declivity ſaw many maſſes of pitchſtone; though I could not find any ſolid rock of that foſſil.

GLEN-

GLENCLOY, GLENDOW *, &c.

GLENCLOY is ſeparated from Glen-Shirreg, by the gradually riſing ridge called Broddick Hill, the northern ſide of which I have attempted to deſcribe. It runs about three miles weſtward from the ſouthern head of Broddick Bay, and is generally a level plain, in moſt places nearly a mile broad. It contains much alluvial ſoil, of a good quality, being chiefly a reddiſh friable earth, which long cultivation has in ſome places made to aſſume a blackiſh hue. Some parts are moſſy, others ſwampy, ariſing from ſprings which are in a progreſs of being drained, and the land they deſtroy reduced to cultivation.

A tract, contiguous to Broddick wood, where the Roſa joins the bay, is occupied by granitic ſand, and is equally ſteril with the tract deſcribed as formed from that ſpecies of ſand on the northern ſide of Roſa. Behind this, ſeveral ruts are diſcernible, ſhewing the various channels the Cloy, or ſtream which runs through the glen, had formerly ſcooped out. Behind theſe, we come to an elevated bank, which exhibits the appearance of a

* *Black Glen.*

a regular fort, with ravelins and baſtions; where the old channel of the Cloy, in front, may naturally be miſtaken for the remains of a wet ditch. This elevated ſpace is moſtly compoſed of ſmall rounded ſtones, and, towards Broddick Hill, of looſe ſand, with a ſmall intermixture of ſoil. It is neither adapted for paſture nor cultivation; but might carry, with advantage, ſome ſpecies of trees. On the riſing grounds which bound the vale, the ſoils are primitive, and are formed from the argillaceous ſandſtone and ſhiver on which they reſt; where clay generally predominates more than in the alluvial.

About half way up this glen, on the ſouth ſide, emboſomed amidſt natural woods and plantations, ſtands the commodious manſion of Captain Fullarton, long celebrated for hoſpitality and a kind reception of ſtrangers.

Glencloy is bounded by high hills, forming a ſort of amphitheatre towards the north-weſt and north. The water divides into two ſeparate ſtreams; and a projecting point narrows the valley, the ſouthernmoſt continuation of which is called Glendow; I ſuppoſe, from the thick and rank heath, which gives it a black appearance.

This glen terminates in a circular hollow, or *corry* *; in ſome parts marſhy; ſurrounded on the

* A ſmall hollow.

the eaſt by a ſemicircular mound of large rounded ſtones, and detached heath-clad rocks, through which the waters have formed a narrow paſſage; on the weſt by an amphitheatre of perpendicular rocks, over which rills of water are precipitated in white foam. The length of Glendow from Glencloy may be about two miles.

The ſtrata of the ridges which bound the glen on each ſide, are red ſandſtone, intermixed with ſtrata of coarſe pudding, or breccia, and variouſly interſected by whinſtone veins.

In the lower part of the glen, near Broddick wood, the ſandſtone ſtrata are thrown up, and a great body of pitchſtone is expoſed to view. It is generally of a dirty green colour; aſſumes a greyiſh tegmen, or cruſt, by expoſure to air, which alſo penetrates into its cracks and vacuities. It exhibits numerous ſmall ſpecks, apparently fellſpars, in a ſtate of decompoſition. But ſome parts of it are of a lively bottle-green colour.

The hills at the head of Glencloy are compoſed of wacken porphyry †, in the form of rude columns, occupying the ſummit like a mural crown. Earth and fragments cover the ſtrata below, and prevent us from ſeeing on what they reſt. They, too, are interſected to their ſummits by whinſtone veins.

At

† See Note [H.]

At the head of Glendow, on the ſouth, the ſtrata of ſandſtone are ſeen to aſſume a higher angle, and become nearly vertical, as they approach the mountain rocks. The latter are primary breccia, forming a wall of from about two to three hundred feet perpendicular; and are alſo interſected to their ſummits by whinſtone veins, which have generally become water-courſes. † This breccia has no appearance of ſtratification.

The ridge which bounds Glencloy on the ſouth, is above a mile broad in moſt places, and riſes equally from the head of Broddick Bay to the ſummit of the hills above Glendow. It is only partially cultivated on the lower parts; but might moſtly be reduced to cultivation. The ſoil is a red clay, in which heavy rains uncover numerous agates and calcedonies, in certain places. Theſe have been derived from the decompoſition of ſoft ſtrata of breccia; and we ſhall ſee that theſe and other ſtones abound in ſuch ſtrata in various other places.

† Mr Jamieſon (Mineralogy of Arran, p. 60.) found ſyenite in Glencloy. I had not followed the ſame route with him; for, except in puddingſtone, or breccia, I did not ſee any of this ſtone in Arran.—See Note [I.]

PRO-

PROMONTORY BETWEEN BRODDICK BAY AND LAMLASH.

This promontory is formed into a peninsula by two burns, which, descending from the hills, suddenly diverge from each other nearly at right angles; the one falling into Broddick Bay, on the north; the other into Lamlash Bay, on the south. The deep chasm of Corry-gills, where are two farms belonging to the Marquis of Bute, forms a smaller promontory on the north. Most of this last promontory is either cultivated, or capable of cultivation; but draining is in many parts necessary.

The main promontory has its centre occupied by jutting rocks; while ledges, decreasing in altitude, form the land into a sort of terraces on either side; and from the summit, a perpendicular ledge, facing Broddick Bay, decreases in altitude, until it terminates in the point of Clachland, which forms the north entrance of Lamlash bay. The highest of these hills is Duin-Dug, which overlooks Corry-gills, is detached from the others, and may be from four hundred to five hundred feet above the level of the sea. The soil, in this tract,

tract, is similar to those already described, mostly of a reddish colour; and in some places clay too much predominates, in others sand. The patches cultivated bear no proportion to the extent which might be profitably subjected to the plough.

On the hill behind the minister's manse, to the east of the road, are some tall obelisks, which seem to have been Druidical circles, or places of worship. Contiguous to these, is a circular mound of loose stones, which seems to have been a small Danish encampment. Further east, are the ruins of what seems to have been a conical building, or fort, such as are still seen in Glenelg, Kintail, Lochalsh, &c.; though the most entire of any I have seen is in the parish of Lochs, west side of the island of Lewis. On the top of Dun Fioun (Fingal's Fort) there is a round eminence, distinguished amidst the heath by its verdure, which seems to have been a vitrified fort, such as abound in the North Highlands, though it is now concealed by soil and grass.

At Springbank, on the boundary of this tract, Mr MacAlister has built a commodious house and offices, where the frank and hearty hospitality of the ancient Highlanders is combined with modern elegance; and where the traveller forgets his toils, or thinks them well bestowed, when they conduct to so much happiness. He has laid out an elegant garden; and is employed in reclaiming an extensive

ſive tract of waſte land, by encloſing with ſubſtantial ſtone fences, draining, liming, &c. &c.

On advancing along the ſhore, from the head of Broddick Bay, the ſtrata on the beach, and in the rocks which compoſe the ſea-bank, are moſtly red, and ſometimes white ſandſtone, alternating with ſtrata of breccia, or coarſe puddingſtone. The latter are generally of great hardneſs, and include pebbles of ſmall ſize, of various ſpecies, and very much rounded, conſtituting the ſtone called by ſome amygdaloid. Some of theſe ſtrata, where the concretions are very ſmall, and the hardneſs great, I doubt not, would make excellent millſtones; a commodity much wanted in this iſland. But by far the beſt millſtones might be procured from a proper ſelection of the granitic ſtrata, which might be ſo conſtructed, as not only to grind corn in the uſual way, but might alſo ſerve the purpoſe of burr-ſtones to grind flour.

Theſe ſtrata are variouſly interſected by whinſtone veins. A remarkable one is noticed by Mr Playfair. It runs ſtraight from north to ſouth, and interſects the ſea-bank to its ſummit, at the place where the firſt ſteep rock occurs below the head of Broddick Bay. Others follow a zig-zag courſe, and often terminate before they leave the ſea-beach; or are interſected by, or ramify into, other veins, which often penetrate the ſea-bank; and in all caſes where I happened to ſee a vein

penetrate the ſea-bank below it interſected the rocks at the ſummit.

Having pointed out the general character of the ſtrata in this tract, I now beg leave to enter into the minute particulars which were obſerved while exploring it.

After paſſing Springbank, the firſt object that attracts notice, is a high rock, cauſed by what is called an up-throe of the metals. I ſhall afterwards have occaſion to explain more fully the ſtratification of the metals in this iſland. At preſent, it is only neceſſary to obſerve, that all ſtrata of granite, ſandſtone, puddingſtone, &c. &c. have two lines of dip and riſe; one towards the contiguous mountains, another making a right angle, or one more or leſs, with this direction. The true line of dip and riſe, is the diagonal between theſe two inclinations. This up-throe running weſtward, forms a ſort of ridge, which divides the Duke of Hamilton's property from that of the Marquis of Bute.

After paſſing this higheſt part of the rock, its height is ſeen rapidly to decline; and there, below the farm of Eaſt Corry-gills, a circumſtance occurs, to which, though I have ſeen ſeveral approaches, I never ſaw any ſo perfect. A ſtratum of white ſandſtone is ſeen included between ſtrata of red ſandſtone, and interſected by perpendicular cracks, or planes, ſo as to be formed into moſt regular,

regular, and truly perpendicular quadrangular columns.

Theſe columns are compoſed of argillaceous ſandſtone, of very fine grain, and great durability; eaſily cut by the chiſel; ſuſceptible of the higheſt poliſh of which ſandſtone is capable; the columns, in ſection, being from three to four feet ſquare, without longitudinal cracks or ſubdiviſions.

Theſe columns reſt on a ſtratum of red ſandſtone, which dips at a very ſmall angle towards ſouth-eaſt. They are covered by ſtrata of the ſame ſandſtone, which dip, in the ſame direction, at an angle of about 45°.

The higheſt column of white ſandſtone towards the north-eaſt, may exceed forty feet perpendicular; and the columns towards the ſouth-eaſt are diminiſhed in altitude by the dip of the incumbent ſtrata, until the laſt one exhibits an altitude of only about ſix feet. Thus, the columns exhibit a very lively repreſentation of one ſide of the pipes of an organ; the line from the higheſt to the loweſt column forming an angle of nearly 45°.

Where the laſt column terminates, a ſtratum of pitchſtone commences, and gradually diminiſhes in thickneſs, until, with the ſuperincumbent ſtrata, it is loſt in the rubbiſh thrown down by the burn from Corry-gills.

The ſtratum of pitchſtone is, in ſome places, amorphous and ſhattery; in others, it is arranged in the form of columns, which are of a ſplintery fracture, of a jet-black colour, though, in ſome poſitions of the light, they exhibit a ſlight tendency towards green. This pitchſtone exhibits a ſilken gloſs, which does not tarniſh by expoſure to the air.

The higheſt part of Dun-Fioun may be about three hundred feet above the level of the ſea. It is ſurmounted by a ſtratum of wacken porphyry, moſtly arranged in the form of rude columns, which form a perpendicular ledge on the northern ſummit, inclined according to the inclination of the ſtrata on which they reſt, until they are loſt in the northern extremity of Lamlaſh Bay, called Clachlan Point.

This ſtratum reſts upon a white ſtratum of argillaceous ſandſtone; below which, red ſhiver and ſandſtone alternate, until we reach a projecting ſtratum of red ſandſtone, below which is ſituated a very thick ſtratum of pitchſtone; and below this, red ſandſtone is continued to the ſea beach.

The ſhiver here, contains a portion of calcareous earth; and to its decompoſition I am inclined to aſcribe the white, red, and yellow clovers, and the great variety of highly nutritious graſſes which grow with ſo much luxuriance, not only on the ſteep

ſteep ſides of the hill, but alſo among the ſtones on the ſea-beach.

The wacken porphyry which ſurmounts Dun-Fioun, with the ſtrata on which it reſts, is, in ſome places, interſected by whinſtone, or baſaltic veins of a dark blue colour. In ſome caſes, theſe veins are fatiſcent at top, being compoſed of blocks which decompoſe in concentric nuclei, while below they are endowed with great durability. In ſome places, the decompoſition of theſe veins above has left gaps in the ledge of wacken porphyry. On examining theſe veins on the ſea-beach at ebb-tide, I found that only a few of the larger ones, into which many others ramify as already ſtated, penetrate the hill. The direction of theſe is from a few points weſt of north, varying from that to north-weſt. Moſt of theſe are ſtraight; ſome are curved; but moſt of the others are either zig-zag, or curved. In ſeveral caſes, the ſandſtone is penetrated with particles, or even exhibits large blocks of the whinſtone immerſed in it; while the whinſtone, again, is penetrated by particles of ſandſtone, or includes blocks of it of a white colour. White ſandſtone in theſe veins ſurpriſed me the more, as the ſtrata which they penetrate are red ſandſtone. But what ſurpriſed me ſtill more, was pieces of granite and porphyry, more or leſs rounded, included in ſome of theſe whinſtone, or baſaltic veins.

The mutual penetration of the particles of the whinſtone and ſandſtone, never extends far on the ſide of the vein, and ſeldom exceeds an inch; though, moſt frequently, it ſcarcely amounts to one fourth of an inch; and on the vein the whinſtone predominates. On the ſide of the ſandſtone, which forms the cheeks of the vein, the ſandſtone predominates; and the whinſtone gradually diminiſhes in quantity, until it is loſt in the ſtrata, often at the diſtance of more than a foot. The veins are dark blue, and very hard whinſtone; and the ſtrata, which either penetrate, or are penetrated, are red ſandſtone; the colour of each, except ſo far as altered by intermixture, being retained in the compound.

With regard to the white ſandſtone, granite, and porphyry, found included in the veins, they certainly had not been ſubjected to any uncommon degree of heat; a moderate quantity of which would have converted the ſandſtone into looſe particles—would have looſened and rendered ferruginous the cryſtals of granite—and an exceſſive temperature would have liquified theſe bodies, and blended them with the common maſs of the vein in which they are included. In place of this, the ſandſtone, granite and porphyry, exhibit no ſenſible variation from rocks of the ſame ſpecies in the iſland.

The ſtratum of pitchſtone is high above the beach at its outcrop, and runs about a quarter of

a mile, with an uniform thickneſs, and the ſame inclination with the ſtrata which include it, until it is loſt among the ſtones and rubbiſh on the ſea-beach. Its thickneſs may be about ten feet. In moſt places it exhibits a white, and in others a ruſty brown, tegmen or cruſt, which inveſts the ſurfaces through its ſeveral cracks. Its colour varies from a greyiſh green to a very dark bottle green. In ſeveral parts ferruginous or whitiſh ſpecks are ſeen, which ſeem to be ſmall fell-ſpars in a ſtate of decompoſition. In places where the darkeſt colour prevails, no ſpecks are ſeen; nor does the ſtone tarniſh, or aſſume a cruſt, by expoſure to the air.

The whole ſtratum is ſubdivided by cracks, or parallel planes, by which it is formed into quadrangular columns of great thickneſs. Many of theſe columns have fallen down, and encumber the ſea-beach. Some, from the decompoſition of the ſandſtone on which they reſt having ſhifted from their original poſition, reſt only on their interior edge, and threaten every moment to cruſh the ſpectator to atoms.

Theſe columns are ſometimes compoſed of ſhiver, or laminæ, irregularly arranged; but, in moſt caſes, they are made up of a great number of ſubordinate columns, varying in length from four to twelve inches, and their breadth ſtill more various. Theſe ſubordinate columns are frequent-

ly arranged in parallel ſtrata; between which laminæ, or ſtratulæ of a darker colour, and not liable to decompoſition, are often interpoſed.

The wacken porphyry, at the northern point of Lamlaſh Bay, affects a rudely columnar form, compoſed of ſeparate ranges which are cut by the ſea. They exhibit numerous fell-ſpars, and cryſtals of lime, of a white colour, and ſatin gloſs. Some of theſe ranges contain angular pieces of dark blue whinſtone, granite, and other ſtones.

On the ſouth, this porphyry is ſoon intercepted by red ſandſtone, which occupies the coaſt to Lamlaſh.

South of the point, on the farm of Eaſter Clachlan (Stoneyfield), a ſteep bank has puſhed out, and expoſed a great depth of excellent clay marl, mixed with a proportion of ſtones. This marl is under a ſoil, whoſe chief defect is too great a proportion of ſand.

The two farms of Eaſter and Weſter Clachlan, have a ſouthern, or ſouth-eaſtern expoſure, and exhibit much good land that has never been touched. The ſtones with which the ſoil is occaſionally encumbered, are hardly ſufficient to make the neceſſary fences and drains. On the ſea-beach are patches of moſs, covering ſea-ſhells, which are occaſionally uſed as manure. Theſe ſhells muſt have been depoſited when the ſea occupied a higher level than it does now; and, at the ſame time, the caves

caves in the rocks, on the ſea-bank, muſt have been formed.

Within tide-mark, below the farm of Eaſter Clachlan, ſaw a ſpecies of pitchſtone, of which, ſaw no parallel in Arran. The ſubſtramen, or ground of the ſtone, is pitchſtone, of a dark bottle green colour, through which are interſperſed rounded pieces of quartz, of a brilliant white colour. The quartz and the pitchſtone, though ſeparated by lines diſtinctly defined, do not form ſeparate ſtones; but are evidently a continuation of the ſame ſtone. The only difference ſeems to be, an infuſion of the colouring matter of the pitchſtone; but how this has been infuſed ſo as to leave rounded nodules, of various, but many of conſiderable ſize, free of any colour, exceeds my comprehenſion. This ſtone loſes its brilliancy by long expoſure, to the air, though it aſſumes no tegmen.

In ſeveral places of the lands above, is ſeen pitchſtone of all the varieties already deſcribed. But ſome is of a dull black colour, both on its ſurface and fracture; its fragments quadrangular or rhomboidal; and contains many fell-ſpars, ſome ſmall, many large; but all more or leſs rounded. This is true pitchſtone porphyry. In the gulley at the farm-houſe of Weſter Clachlan, is a very large ſtratum of dark green pitchſtone, included between ſtrata of red ſandſtone, which does not tarniſh by expoſure to the air.

On

On the ſea-beach, below Weſter Clachlan, a bore was formerly ſent down in queſt of coal. But the borer happened to break his rods, which he could not extract; and this accident ſtopped his operations, before he had penetrated to any great depth. The people here are firmly perſuaded that he broke his rods intentionally, after he had touched coal, being bribed by the coalmaſters in Ayrſhire. From the ſuggeſtions of ignorant people, who have viſited the iſland, they hold the pitchſtone, which abounds in this promontory, to be either coal in a particular form, or an infallible ſymptom of coal: and they expreſs themſelves in very ſtrong terms on the abſolute certainty of coal being here, and near King's Cove, on the oppoſite ſide of the iſland. Attempting to undeceive them, only makes them wax wroth, and to throw out very broad hints, that you, too, are bribed by the coalmaſters of Ayrſhire.

But I ſhall ſtate a few reaſons, which appear to me concluſive againſt the exiſtence of coal, either here, or at King's Cove.

1. Pitchſtone, in place of being favourable to coal, appears to me to be an utter repellent of it.

2. Between the outcrops of the ſtrata, here are no ſtrata of blaës, or the uſual metals attending coal.

3. Though a ſtratum of very white ſandſtone, and of very fine grain, is occaſionally ſeen interpoſed between

between the ſtrata of red ſandſtone, yet this white ſandſtone is very different from the ſandſtone which uſually covers coal. The latter is generally of a blue or bluiſh colour; of a grey or whitiſh grey; of a yellow or whitiſh yellow colours. The blue, and bluiſh, are generally of fine grain, but often hard. The grey, and whitiſh grey, are generally ſoft, and eaſily cut by the chiſel, but moſtly of coarſe grain, unſuſceptible of a fine poliſh, and ſoon tarniſh by expoſure to the air. Theſe often contain martial pyrites, which makes them aſſume a black colour; and, by their efflorescence, makes the ſtone fall off in thin ſcales. The yellow, or yellowiſh white, is commonly of ſmall grain, and eaſily cut. But where there is a mixture of the whiteiſh grey with the yellowiſh white, and a very ſmall grain, the ſtone is generally very hard; but ſuſceptible of a poliſh in which you can ſee your ſhadow. Theſe are the ſandſtone ſtrata which, as far as my obſervation extends, uſually accompany coal.

4. With a very few interpoſitions of white ſandſtone, the ſtrata here are red ſandſtone: and I never yet heard of coal, or ſaw it under ſandſtone of this deſcription.

5. The ſtrata here are ſo much interſected by whinſtone veins, or dikes, that though coal were found, its continuity would be interrupted at very ſhort diſtances, often not exceeding a few ſquare yards.

I am aware that I appear like the honeſt man who undertook to aſſign five reaſons, to a criminal court, why a principal evidence did not appear at a trial. His firſt reaſon was, 'My Lords, the man 'died yeſterday.' On which he was ſtopped, and informed that there was no occaſion to bring forward his other four reaſons, the firſt being perfectly ſufficient.

Returning over the hills, an irregular ſtratum of pitchſtone is ſeen near the top of Dun-Fioun, and contiguous to the vitrified fort. It reſts on the tops of the columns of wacken porphyry, which on this ſide ſlope at the ſame angle with the red ſandſtone which riſes towards it, and probably, at one time, covered both the pitchſtone and wacken, ſhowing that the latter is merely an angular ſtratum interpoſed between the other ſtrata.

Other pitchſtone is viſible in the hollow between Dun-Fioun and Clachlan-Dun; though this is ſurrounded by ſoil, and the ſtrata with which it is connected are not viſible.

The hill of Clachlan-Dun is ſomewhat higher than Dun-Fioun, and exhibits a perpendicular ledge of rudely columnar wacken porphyry, facing the north-eaſt and north, which is probably a continuation of the ſame ledge which ſurmounts Dun-Fioun. The ſide of this hill, towards Broddick Bay, is not ſo abrupt and precipitous as that of Dun-Fioun. It is all covered with earth and ſtones,

ſtones, evidently the wrecks of decompoſable ſtrata; but, except towards its baſe, where red ſandſtone appears, there is no opportunity of aſcertaining the ſtrata of which it is compoſed.

Near the higheſt pinnacle of this hill, and a ſhort way below the ledge of wacken porphyry, a vaſt body of pitchſtone juts out. About ſixty feet perpendicular below, a body of equal magnitude is ſeen.

Theſe bodies of pitchſtone are ſurrounded with ſoil, ſo that we cannot ſee the ſtrata with which they are connected. They are generally of a very dark bottle green colour; often approaching to that of real pitch, or jet; aſſume no tegmen; and their ſtructure is either ſhattery or lamellar, ſeldom columnar.

The top of Dun-Dug, north from this, is ſurmounted by the moſt perfect baſaltic columns * I any where obſerved in Arran. Thoſe I examined are of five equal and ſmooth ſides, about fourteen or fifteen inches diameter; and expoſure to the weather has cauſed them to aſſume a white tegmen, which generally penetrates to a conſiderable depth. The columns lean conſiderably towards the ſouth-eaſt, and ſome are nearly horizontal. They probably reſt upon ſoft materials, which having been decompoſed, they have jutted out

* See Note [K.]

out below, and broken into many fragments above. Did not ſee on what they reſted, but ſuſpect it to be ſandſtone or ſhiver. When broken to ſome depth, they are found to contain many rounded ſmoaky quartz, with more or leſs of rounded fell-ſpars, of a white colour, though ſometimes black, inſerted in a ground of dark blue baſalt. They are, therefore, true baſaltic porphyry.

Pitchſtone is ſeen jutting through the ſoil in various places to the north and north-weſt of this hill. In one place near a ſmall burn, it is thrown almoſt on edge, and exhibits all the external characters of a dike, or vein. But it is ſeen to reſt on red ſandſtone, which makes the ſame angle with the horizon as the pitchſtone; and hence, this muſt be a trouble in the metals, not a vein.

On the northern aſcent of the hill, a very broad ſtratum of pitchſtone croſſes the Lamlaſh road; and from the way it has been cut in forming the road, exhibits all the appearance of a vein. It is compoſed of ſeveral ſubordinate ſtrata, which vary in colour, from a dirty to a dark bottle green; and is very ſimilar to the pitchſtone near Broddick Wood. From inſpecting the neighbouring burn, it is ſeen to be a ſtratum included between two ſtrata of red ſandſtone.

The hills above this promontory are compoſed of red ſandſtone, alternating with red, and ſometimes white ſhiver. The firſt are ſometimes calcareous,

reous, and occaſionally exhibit ſmall rounded nodules of limeſtone. Theſe ſtrata are alſo interſected by whinſtone veins, and are continued until they meet the primary puddingſtone, deſcribed as bounding Glen-Dow.

Near the bottom of the burn which bounds this promontory on the ſouth, a vaſt body of red clay marl is ſeen above the mill, and below the manſe, of Kilbride. The land contiguous to it, eſpecially towards the ſouth, is moſtly a ſteril ſand, which this clay would conſolidate.

Within tide-mark, in Lamlaſh Bay, near this place, there is a conſiderable ſtratum of coralline ſhell-ſand, which the people take out, at ebb-tide, for manure. It is ſaid to get below earth towards the land; and may probably paſs up through the glen, which has been formerly occupied by the ſea, though now filled with earth waſhed from the hills.

ISLAND OF LAMLASH, BAY, &c.

The iſland of Lamlaſh is ſtretched acroſs a ſpacious bay, which it defends from every ſtorm. Its Gaëlic name, when tranſlated, is *Holy Iſle*, becauſe St Molios * long choſe it as the place of his reſidence. I ſaw a cave on the weſtern ſide of the iſland, in which he lived. It is an excavation in the red ſandſtone which forms the baſis of the iſland, formed by the ſea when it occupied a higher level than it does now; aided apparently by art. There is a narrow projection of rock, a little elevated above the floor, which is ſaid to have been his bed; and the mouth of the cave ſeems to have been defended by a wall of looſe ſtones. Adjoining to the cave, there is a ſpring of very pure water, for which a ciſtern has been built of maſonry, with a ſtone ſpout which delivers the water. This ſpring has been long celebrated for its miraculous cures of every diſeaſe incident to the human frame; and people come from very remote diſtances to bathe their debilitated limbs in the ciſtern, or to imbibe

* Pronounced Molees; *o* after *i* in Gaëlic being quieſcent, and *i* marking the ſame ſound as *ee* in Engliſh.—Molios means *ſervant*, or *ſhaveling*, *of Jeſus*.

imbibe its life-reſtoring water from the ſpout. This miraculous power was ſuppoſed to have been conveyed to the water in conſequence of the prayers and benedictions of the Saint: and though the ſpring has long ceaſed to work miracles, the people ſtill entertain for it a ſort of ſuperſtitious veneration.

I could not help remarking, that this Saint, along with many others whom I may have occaſion to ſpecify, acquired his celebrity, when dirt, naſtineſs, and abſurdity, formed the moſt prominent features of ſanctity. Had he choſen a ſimilar cave on the oppoſite ſide of this iſland, where no boat could approach him, and where people from Arran could not get to him without danger of breaking their bones among the looſe fragments of rock, with which the beach is encumbered, we might have believed him to have retired from the haunts of men in downright earneſt. But he choſe a reſidence where the channel is narroweſt, and moſt eaſily acceſſible from Arran, and within the bay, where veſſels from all quarters would find ſafety. Hence his object muſt have been, not to retire from the world, but to draw the world after him; and I doubt not but in this cave he diſplayed more pride, vanity, and pompoſity, than Diogenes in his tub, or Bonaparte while ſeating himſelf upon a throne.

Oppoſite to the village of Lamlaſh, at the broadeſt part of the bay, there is a ſmall veſtige of what was formerly a religious houſe; but whether occupied by monks or nuns, I could not learn. It was founded either by St Molios, or in conſequence of the ſuperſtitious veneration for the iſland, occaſioned by his having conſecrated it by living in the cave. Their church was long the only church belonging to Arran; and after a church was built on the Mainland, they ſtill continued to bury their dead within the conſecrated ground of this monaſtery. It happened, that a ſudden ſquall of wind overſet an overloaded boat, and drowned ſeven people attending a funeral proceſſion; and, ſince that time, the people bury their dead around the ſeveral places of worſhip in Arran.

The iſland may be about two and one half, or three miles long, and about half a mile at its broadeſt part, which is where it is higheſt. Below, it is moſtly compoſed of red ſandſtone, on which are placed range above range, or rather *ſtratum ſuper ſtratum*, of rudely columnar baſalt. But in all caſes where I obſerved the columns reſting on the ſandſtone, a ſtratum of white ſandſtone was always interpoſed between the red ſandſtone and the columns. Theſe ranges of columns, riſing above each other, convey to the iſland an aſpect of gloomy grandeur. From a barometrical meaſurement

ſurement of the late Mr Burrel, it appears that the higheſt pinnacle is 297 yards, or 891 feet above the level of the ſea. Mr Burrel alſo eſtimates the iſland to contain 18 acres arable, (I ſuppoſe he means land that was cultivated in his time), and 446 paſture, making the whole iſland 464 acres. At the ſouth end from 50 to 60 acres of ſoil well adapted for ſown graſſes and green crops, might be brought into cultivation. I was told that a few acres here were formerly ploughed, and yielded an excellent crop of oats. The crop was put up into a ſtack upon the ſpot; but which, when they came to remove it, was found to ſwarm ſo much with ſerpents, that they were obliged to ſet it on fire.

The iſland is rented by Captain Hamilton of the Revenue Cutter, and depaſtured by a few ſheep and goats. The Captain has built a commodious houſe near the north end, and has laid out an extenſive garden, where he raiſes every uſeful, and many ornamental, vegetables, in the higheſt luxuriancy and perfection, on a ſoil compoſed almoſt entirely of baſaltic pebbles.

The ſides of the iſland generally exhibit a perpendicular wall, compoſed of ſtrata of ſandſtone, ſurmounted by *ſtratum ſuper ſtratum* of rude baſaltic columns, forming a ſort of terraces on the weſt ſide.

South from the Saint's Cave, theſe columns conſiſt of a ſpecies of baſalt, of which I never be-

fore ſaw any parallel. Except by ſuperior hardneſs, their fracture is not to be diſtinguiſhed from ſandſtone, of a tolerably fine grain. Their colour is either white, greyiſh white, or yellowiſh white; the two laſt occurring moſt frequently. They may eaſily be miſtaken for columnar ſandſtone; but the circumſtance which decides them to be of the baſaltic genus, is, that when ſtruck by a hard body, or their fragments ſtruck againſt each other, they emit a tinkling ſound. This laſt quality is laid down by Dr Walker as a diſcriminating character of baſalt.

I ſhall therefore call them arenaceous baſalt.

Further on, towards the ſouth end of the iſland, where the baſaltic cliffs become high and precipitous, they are compoſed of columns of immenſe ſize, of a quadrangular form, each of which is made up of thin laminæ, every way reſembling ſlates, adhering together in a very irregular manner, but eaſily ſeparable; and many of them might even be formed into ſlates of ſufficient ſize for covering houſes. The ſurfaces of theſe ſlates exhibit a dark, gloſſy, blue colour, of various intenſity, derived apparently from a coating of petroleum, or mineral pitch. Their croſs fracture is bluiſh grey; their hardneſs great; and they tinkle when ſtruck againſt each other.

The laſt mentioned columns do not, like the others, reſt upon the ſandſtone, but interſect both it

it and the other columns, and ſeem to occupy an immenſe vein, running nearly from north to ſouth.

After paſſing theſe maſſy columns, we find the baſis of the iſland occupied by white ſandſtone, of a very fine grain. Here the rocks become lower, and the ſandſtone is cut off by what ſeemed veins, or compartments of white arenaceous baſalt, or perhaps ſilicious ſandſtone; for I had not time to examine them minutely.

On the ſea-beach around the flat land at the ſouth end, ſeveral veins are obſervable. The firſt that occurs is a large vein of fatiſcent whinſtone †, compoſed of large rounded blocks, of great hardneſs, radiated or fibrous, and difficult to break, inſerted in a ſofter matter, of a black colour, arranged in concentric layers; apparently the former decompoſed. At the ſouth end are ſeveral large veins of baſaltic porphyry, ſome of which affect a rude columnar form. Several of theſe veins, and others in the iſland, are ſeen to interſect not only the ſandſtone ſtrata, but alſo the columnar ſtrata of baſalt which reſt upon them.

Returning northward, on the oppoſite ſide of the iſland, the large vein of fatiſcent whinſtone is ſeen running in its original direction, which is nearly towards north-eaſt. Beyond this the rocks

 become

† See Note [L.]

become high, and are compoſed of ſtrata of white ſandſtone, placed at an angle of about 45°, having ſtrata of fatiſcent whinſtone interpoſed between, or alternating with, the ſtrata of ſandſtone. Some of the whinſtone ſtrata are of conſiderable thickneſs, and are compoſed of huge blocks inſerted in a ſofter matter, ſuch as has been already deſcribed. Theſe blocks contain numerous zeolitical concretions, moſtly of a white colour, a ſilken gloſs, and radiated cryſtallization. Many are like fans, ſpread to various extent, ſulcated from the centre, and are that variety of zeolite, abſurdly called Tremolite. Were it not for their flatneſs, they might eaſily be miſtaken for ſea-ſhells; though they cannot impoſe upon one who has ſeen real ſhells, of large ſize, and perfect ſhape, in pentagonal columns of baſalt, in the Shiant Iſles, the property of Lord Seaforth, off the coaſt of Lewis. The latter ſhells effervеſced powerfully with an acid; which was not the caſe with the zeolitical concretions under conſideration.

Further on, the rocks begin to correſpond with thoſe on the oppoſite ſide of the iſland, being red ſandſtone, ſurmounted by precipitous cliffs of baſalt. Below the higheſt pinnacle of the mountain, which I take to be directly oppoſite to the holy man's cave, the red ſandſtone is vaſtly more elevated than on the oppoſite ſide, and ſhows its dip

to

to be towards north north-weſt, which dip all the columnar ſtrata above reſpect.

This part I take to be the outcrop of the metals on which the columnar ſtrata are ſuperimpoſed; and I ſhall often have occaſion to remark, how little ſuch ſtrata, in compariſon with contiguous ſtrata, deviate from the horizontal plane. Here the ſandſtone ſtrata are of conſiderable altitude; but if we conſider the diſtance they run, before they ſink out of view, and leave nothing viſible but the baſalt which reſts upon them, and which alſo becomes comparatively low, we ſhall be aſtoniſhed at the approach towards horizontality, and great regularity, which diſtinguiſhes theſe from all other ſtrata in the neighbourhood.

Further on, the ſea-beach is encumbered with rude maſſes of baſaltic columns, often quadrangular, but moſtly five ſided, which render the paſſage not only difficult but dangerous. Here the baſis on which the baſalt reſts is concealed from view. The ſolid rocks conſiſt of arenaceous baſalt, in rude columns, arranged *ſtratum ſuper ſtratum*; and though each ſtratum of columns be very lofty, their ſtratification is regular, and their dip nearly as already deſcribed.

Obſerved ſeveral veins of whinſtone interſecting the baſalt. Some of theſe conſiſt of large blocks,

which exhibit a rude approach to the external figure of garnets.

The Bay of Lamlaſh may be about three miles, in a right line, from its northern to its ſouthern entrance; and at its centre it forms a ſort of ſemicircle, of nearly two miles acroſs, having the Holy Iſle on one ſide, and the vale of Lamlaſh on the other. The northern wing projects nearly towards north-eaſt, while the ſouthern projects nearly towards ſouth-eaſt, giving to the whole a figure approaching to that of a horſe-ſhoe, which prevents the waves of the ocean from getting in to the interior bay. The two inlets may be about a quarter of a mile in breadth at their mouths, and widen gradually as they approach the central bay. The ſouthern inlet is preferred by mariners, becauſe here there is no danger but what is ſeen. The northern inlet is equally ſafe to thoſe who know it: but the tails of rocks we have deſcribed as projected from Dun-Fioun, and the gradual decreaſe of altitude of the rocks on the oppoſite point of Holy Iſle, cauſe them to extend a conſiderable way below the ſea, before they ſink out of the reach of veſſels drawing a great depth of water. But to thoſe who know the channel, there is ſufficient depth, at both entrances, for the largeſt ſhips of the line.

Within,

Within, there is good holding ground; sufficient depth for the largeſt ſhips; and room enough for the greateſt navy to ride at anchor. In fact, this is one of the beſt harbours in the Frith of Clyde,—if not in the world.

VALE OF LAMLASH, &c.

From the broadeſt part of the Bay of Lamlaſh, a beautiful vale extends weſtward about two miles, its greateſt breadth being about one mile. A beautiful village, forming a ſegment of a circle at the head of the bay, has the bay and Holy Iſland in front, the vale bounded by high hills behind, and in all points of view exhibits the moſt picturesque ſcenery in the world. The riſing ground on the north of the village, is interſected by belts of Scotch firs, which have not been planted in ſufficient denſity, as they thrive beſt along the ſkirts of the riſing ground, where they are in larger quantities. In ſome parts of the vale, ſtreams of water have waſhed away the ſoil, leaving rounded ſtones, among which ſtunted allers are here and there ſprinkled.

In front of the village, Dutcheſs Ann, who ſeems to have been a woman of ſuperior capacity, cauſed a harbour to be built of large quadrangular blocks of ſandſtone. We may form ſome idea of the magnitude and ſolidity of this work, when informed that it coſt 2913l. 10s. $5\frac{4}{12}$d. Sterling, at a time when maſon's wages are ſaid to have been

been eightpence, and labourer's wages fourpence per day. It is a great pity this building was allowed to be demoliſhed; becauſe its ruins render the village of more difficult acceſs from the ſea, than if it had never been conſtructed; and the numerous veſſels which frequent the Bay would find much ſecurity, were there a place where they might repair any damage they had received, or might lay in an additional ſtock of proviſions. Though the conſtruction of this harbour did not immediately operate in exciting a traffic here, the local ſituation is well adapted for the purpoſe; and it is impoſſible to ſay what effects it might have produced in progreſs of time.

Advancing along the northern boundary of the vale, banks of clay marl, of a red colour, are ſeen to jut out in many places towards the riſing ground. This ſtuff, being waſhed down, ſeems to have cauſed the extraordinary fertility of ſome fields lower ſituated; and would form an excellent dreſſing for thoſe tracts of ſoil whoſe chief defect is too great a proportion of ſand.

The ſtrata along the bay are red ſandſtone, interſected by numerous veins of whinſtone, and often exhibiting a penetration of the whinſtone on the cheeks of the vein. Some of theſe veins are what I have called arenaceous baſalt, moſtly of a white colour; and ſometimes maſſes of dark blue whinſtone are found inſerted in the white baſalt.

Towards

Towards the upper part, the vale ſeparates into two glens, Benleſter and Monymore, which are divided by a high rounded ridge of hill, bearing a ſtrong reſemblance to an immenſe hay ſtack. At the point of this hill ſeveral ſtreams might be made to unite, and afford waterfalls of great power for manufacturing machinery.

In the lower part of Benleſter, which is the northern glen, the ſtrata are compoſed of red, and ſometimes white ſandſtone, interſected by numerous veins of whinſtone, or of whinſtone porphyry. The ſummit of the hills is occupied by precipitous baſaltic cliffs, over which the waters are projected in awfully grand caſcades. Beyond theſe, ſtrata of ſandſtone, alternating with puddingſtone, are divided by cliffs of baſalt, until we reach the ſummit of the iſland.

Here, at a place called Alcrappoch, about four miles from Lamlaſh, a rock of what appears to be primitive puddingſtone, juts out from the ſurrounding maſſes. It is of a bluiſh ſchiſtic ground, very hard, and contains numerous rounded pieces of quartz and baſalt, moſtly of a ſmall ſize. On the weſt of this rock, the burn has expoſed a vein of limeſtone, from twenty to thirty feet broad; though it may be broader, as its weſtern ſide is covered with earth. It is nearly perpendicular, runs towards the north, but inclines, at a very ſmall angle, towards the eaſt. It is compoſed

poſed of numerous rounded pieces of indurated chalk, of a white, or yellowiſh white colour, united together by a ſparry cement. Other pieces, and what has ſometimes the appearance of ſubordinate veins, conſiſt of a reddiſh or blue limeſtone, exhibiting, in their fracture, numerous ſhining particles of ſpar. Where it begins to be covered with earth, it becomes ſparry; and there it exhibits ſome indications of copper. The only circumſtance which ſeems to contradict the opinion I have hazarded, that this is a vein, and that the rocks including it are primary puddingſtone, is, that a thin ſtratum or vein of white argillaceous ſandſtone, ſoft but durable, is interpoſed between the puddingſtone and limeſtone. The puddingſtone, alſo, in ſome parts, is arranged in maſſy quadrangular columns, ſimilar to baſalt; and I never yet ſaw columns but they formed ſtrata, and generally of great regularity. The ſmallneſs of the concretions too, in the latter rock, their great rotundity, and their difference from thoſe farther on, (which I may afterwards have occaſion to deſcribe), ſeem favourable to the idea of this puddingſtone, and the limeſtone included in it, being ſtrata. But if they be ſtrata, they are of very imperfect formation; and approach nearly to the primary puddingſtone beyond them, where veins are perceived, but hardly any apparent ſtratification.

My object is to record facts, as far as my obſervation

ſervation extends, and leave to future Naturaliſts to point out their reaſon and cauſe. The higheſt ſummit of the iſland here, ſouth of the ſchiſtic and granitic mountains, may be about eight hundred feet above the level of the ſea. A tract, or foot-path, from Lamlaſh to the oppoſite ſide of the iſland, paſſes near this rock; and if ever this tract ſhould be converted into a road, (againſt which there is no phyſical obſtacle), this limeſtone may come to be uſeful. Around it are inexhauſtible moſſes, containing peats hardly inferior to coal; and, by proper management, fully adequate to burn the ſtone into lime.

The only burn which here expoſes rocks, runs nearly from the ſouth, in the face of this limeſtone. Theſe rocks are red ſandſtone ſchiſtus, often alternating with red argillaceous ſchiſtus, called *keel* by the people of Scotland; becauſe it is often uſed for drawing lines on boards, &c.; or red ſhiver, in which there is no mixture of ſandſtone. Theſe ſtrata deviate very little from the horizontal plane, though they have a very ſmall inclination towards the north. They are formed into compartments, and interſected at almoſt equal diſtances, by very broad veins of cuneiform and priſmatic whinſtone, compoſed of looſe fragments, and jutting perpendicularly through the ſtrata. Theſe large veins and ſtrata are interſected by other ſmaller veins of whinſtone, running in various directions, among

among which I diſtinguiſhed ſome veins of white arenaceous baſalt, in which rounded blocks of dark blue whinſtone were included. The large broad veins of cuneiform whinſtone are ſometimes of equal, ſometimes of greater, breadth than the ſtrata interpoſed betwixt them. They are all parallel to each other, and run nearly from ſouth-eaſt to north-weſt. The other veins often meet, and are cut off by each other. Often they terminate without any viſible cauſe; but, when they are ſeen to penetrate either the ſtrata, or the larger veins, they interſect them to their ſummits.

The glen of Monymore projects from the vale of Lamlaſh nearly in a ſouth-weſtern direction. It exhibits nearly the ſame ſort of ſtrata as thoſe deſcribed in Benleſter—red, and ſometimes white ſandſtone, interſected by veins of whinſtone-porphyry, or whinſtone. I obſerved that the ſandſtone contiguous to the veins is often of a white colour, ſhattery, and contains numerous quartzy concretions. Often ſmall veins of this ſandſtone are included between two whinſtone veins. In other caſes, rounded fragments of white ſandſtone are inſerted into the veins, while, on the other hand, fragments of the whinſtone are inſerted in the ſandſtone. In not a few caſes, the whinſtone penetrates the ſandſtone contiguous to it; to which it conveys ſuperior hardneſs, and part of its colour.

Near

Near the ſummit of this glen, found ſeveral large blocks of limeſtone, and traced them to a place where the ſtrata are covered by ſtones and rubbiſh. There muſt be limeſtone not far from this place, though concealed from view.

Paſſed over the higheſt ſummit, and deſcended part of Glen Scordel, which runs nearly in the ſame direction with Monymore ;—ſtrata ſimilar to thoſe deſcribed. The tops of the hills are ſurmounted by ledges of cuneiform or priſmatic baſalt ; and in many caſes it affects the columnar form.

Returned by the ſummit of Garbin *(rugged hill.)* On the ſouth-weſtern aſcent, the rocks are moſtly fatiſcent whinſtone of a dark colour, approaching to black, arranged in large veins, and exhibiting rounded blocks, imbedded in a ſoft matter, which is often of a ruſty colour. Towards the ſummit, this hill is compoſed of hard, ſhattery, and priſmatic whinſtone, or baſalt,* ſimilar to ſome parts of the rock of Edinburgh caſtle, of a blue colour internally, but, by expoſure to the air, it aſſumes a white tegmen. This rock may be about eight hundred feet above the level of the ſea. It is already precipitous towards the north and north-eaſt ; and after water ſhall have waſhed

* See Note [M.]

ed the ſofter ſtrata from its ſides, it may come to ſtand detached.

With much difficulty and danger, deſcended by a precipitous burn on the eaſt of Garbin, which runs northward into the Glen of Monymore. The ſtrata are red, and ſometimes white ſandſtone, dipping rapidly in the direction of the burn. They are croſſed by numerous maſſy veins of whinſtone, which cauſe frequent caſcades. Towards the bottom of the burn, ſhattery or priſmatic baſalt; which exhibits a rude and almoſt vertical ſtratification, and extends to the top of Garbin. Thus this rock ſeems only to be an enlargement of ſuch veins as were deſcribed at the ſummit of Benleſter. In both theſe glens, broad compartments of this hard ſhattery whinſtone often occurred; and correſponding cliffs were ſeen on the ſummits of the oppoſite hills. Thus theſe cliffs appear to be veins, of larger ſize, which reſiſt decompoſition better than the materials in the ſmaller veins, and therefore they occupy the ſummits of hills, or of hills approaching to mountains.

Returning to the bottom of the Vale of Lamlaſh, on the ſouth ſide, vaſt ſtrata of pitchſtone jut above the ſurface of the cultivated land. Theſe ſtrata incline towards ſouth-eaſt, and run about a mile towards ſouth-weſt, which is alſo the caſe with the ſtrata of red ſandſtone between which

they are interpoſed. The fragments of theſe ſtrata form a broad zone along the riſing ground which bounds the vale on the ſouth; and the ſolid ſtrata appear again, in large maſſes, beyond a burn, towards the riſe of the hill. Their colour varies from a faint to a dark bottle-green.

PRO-

PROMONTORY BETWEEN LAMLASH AND WHITING BAY.

This promontory exceeds four miles from north to ſouth, and is more than two miles from the ſea to the mountains. Its higheſt part is towards Lamlaſh, where it may be about two hundred feet above the level of the ſea; and it ſlopes ſouthwards to Whiting Bay. A hollow ſeparates it from the hills, which has moſs in the upper part, and is wet and ſwampy lower down. It contains much improveable land, though it is only cultivated partially in the lower parts towards the ſea. The ſoil is generally a reddiſh friable clay in the higher parts: below it is frequently alluvial, and in theſe caſes abounds too much with ſand. Some deep gullies interſect the lower parts, and expoſe banks of red clay marl, generally below a ſandy ſoil.

The ſtrata are moſtly red, and ſometimes white ſandſtone, frequently alternating with red ſhiver. On the ſouthern ſide of Lamlaſh Bay, very fine white ſandſtone occurs. The ſtrata are variouſly interſected by whinſtone veins.

Along the ſhore of Whiting Bay, the ſtrata are much interſected by whinſtone veins, running

in various directions, and ſometimes croſſing each other, without mixing, or communicating their ſubſtances. There is often a mutual penetration of the whinſtone and ſandſtone. Parts of the whinſtone alſo contain nodules of a darker coloured whinſtone than the body of the vein.

Glen Aſhdale, which diſcharges its waters into Whiting Bay, is ſo called on account of numerous aſh trees which formerly grew in it. They are now nearly extirpated, and only a few aller buſhes left in their place. It runs nearly from eaſt to weſt.

The dale, eſpecially on its northern ſide, exhibits numerous banks of red clay marl; though there is alſo ſome red clay which is not marl. In many places, the banks form beautiful ſloping hollows and declivities, with a ſouthern expoſure, which would be well adapted for fruit trees, as they are ſheltered towards the north, and have a marly bottom. In ſeveral places, the marly banks have puſhed out, and fallen down; and where portions of the marly clay have been waſhed upon ſandy ſoil, the various ſpecies of clover, and ſweet graſſes, are growing with the utmoſt luxuriance; proving the great efficacy of this marl to improve ſuch ſoils. In ſome caſes, by the ſhifting of the banks, the marl is brought to the ſurface, and forms a very ſteril ſoil, which would require an addition of other earths to render it fertile. Where this

this has not happened, the ſoil above it is ſuch as the marl would improve.

The ſtrata are ſimilar to thoſe ſo often deſcribed; and it frequently happens, that the veins which interſect them are compoſed of various ſpecies of whinſtone in the ſame vein, ſuch as baſaltic porphyry, fatiſcent whinſtone, and ſteatitical. When a vein is either fatiſcent, or ſteatitical, often the contents are removed, and it ſerves to conduct rills of water into the glen.

When theſe veins are compoſed of hard materials, they ſerve as bones to protect the ſandſtone from the eroſion of water, and always form a caſcade where they croſs the burn.

A vaſt vein of this ſort croſſes the burn where the glen becomes narrow. It is ſurmounted by a ſtratum of rudely columnar arenaceous baſalt, which the water has removed; but which forms ledges of rock at the ſecond elevation of the hills on each ſide. The vein on which the columns reſt, exhibits a perpendicular face of hard ſhattery baſalt, of a blue colour, and ſplit ſo as to reſemble a rude ſtratification, at an angle of about 80°, ſimilar to the baſalt of Garbin. This barrier forms a caſcade more than one hundred feet perpendicular; and when the burn is ſwelled, people may paſs dry between the water and the rock over which it falls.

With ſome difficulty and danger having aſcended this barrier, found another caſcade behind it, more than fifty feet perpendicular, faced by another hard barrier of baſalt. For a conſiderable way backwards, the ſtratum of columnar baſalt formed perpendicular cliffs on the ſide of the burn, and reſted on various and parallel veins of baſalt, which were ſeen croſſing the burn, and were all of a different ſpecies from the columns which reſted upon the veins.

For a great way behind this, the ground is ſomewhat level, and the ſtrata are the uſual red ſandſtone, interſected by various whinſtone veins.

At laſt we came to a vaſt ſtratum of arenaceous baſalt, formed into rude perpendicular columns, and reſting on ſtrata of red ſandſtone, with ſometimes beds of white ſandſtone, or red ſchiſtus, interpoſed. The columnar ſtratum, with thoſe on which it reſted, were almoſt in a horizontal poſition. This ledge of columns forms the ſummit of the mountains on each ſide.

One circumſtance deſerves attention here,—that the firſt mentioned ſtratum of perpendicular columns, which reſts on numerous veins of whinſtone, or baſalt, was no where ſeen to be penetrated by any of theſe veins. Whereas the columns now under conſideration, with the ſtrata on which they reſt, are interſected, to their ſummit, by numerous veins of whinſtone, of various ſpecies;

cies; but many of them are fatiſcent, and much decompoſed. In one inſtance, a ſort of red clay ſhiver occupies a vein, which a rill of water from the ſouth has ſcooped out, ſo as to form a long perpendicular mine.

Theſe ſtrata ſeem to be continued much further in this direction. But my conductors were averſe to advance any further, on account of numerous ſerpents ſaid to ſwarm among the heath and blocks of ſtone, warmed by the burning rays of the ſun.

After an excurſion towards the ſouth, returned over the top of Knocklecarleu, *Hill of Conſultation*, ſo called becauſe the people are ſaid to have aſſembled here, with a view to deliberate when they were invaded by enemies. Deſcending towards Whiting Bay, found ledge above ledge of baſaltic rocks, which are either extenſions of the veins deſcribed, or continuations of the arenaceous baſalt. Behind each ledge were flat ſpaces, or terraces, of land. At one ledge a great vein of pitchſtone was ſeen included between two veins of whinſtone; and ſome veins of the latter, at the top of certain terraces, contained a mixture of pitchſtone. The loweſt terrace contains a conſiderable extent of land formerly cultivated, but whoſe cultivation has been ſince abandoned.

The veins which ſupport theſe terraces are moſtly concealed by earth waſhed from the terraces, which has formed very ſteep banks; and

the veins are only viſible here and there at their ſummits.

South from the inn of Whiting Bay, a bank is expoſed by the river, which had evidently been formed by depoſitions from the river; though it has now cut a lower channel than that which it occupied when the materials of this bank were depoſited.

The firſt and loweſt ſtratum of this bank, and which forms the channel of the burn, is a very weak ſpecies of clay marl, of a browniſh colour, and mixed with rounded ſtones. 2. Strata of rounded ſtones and ſand, concreted, in many parts, apparently by the infiltration of iron and clay, ſo as to form a ſort of pudding and ſand-ſtone. 3. A ſtratum of moſs about two feet in thickneſs. 4. Concreted ſand and gravel as before. 5. A ſtratum of moſs. 6. Concreted ſand and gravel. 7. Different ſtrata of looſe ſand and gravel up to the ſuperficial ſoil, which is of various depth, and compoſed of a mixture of ſand and vegetable mould.

The moſs is arranged in thin laminæ; contains many fragments of wood, and vegetable impreſſions; and can hardly be diſtinguiſhed from ſome ſpecies of coal ſchiſtus, or blaës. It alſo throws out a copious effloreſcence of alum, and of ſulphate of magneſia.

May

May not this help to illuſtrate the origin of coal, and what are uſually called the coal-metals? In ſome parts of the north Highlands, I obſerved moſſes of conſiderable thickneſs, over which a great depth of ſand had been thrown, either by the wind, or waſhed down by rills of water. In ſome parts, this ſand was concreting into ſtrata of ſandſtone; while the moſs below, in its progreſs of conſolidation, had ſhrunk, leaving cracks, which divided it into rhomboidal pieces, with ſmooth ſurfaces, every way reſembling what is commonly called cubical coal. Were a ſufficient depth of ſand thrown over ſuch moſſes, I doubt not but the one would gradually conſolidate into ſandſtone, the other into coal.

FROM THE DIPPING TO THE STRUEY ROCKS.

The dipping rocks form the boundary of Whiting Bay towards the ſouth, and project a perpendicular promontory into the ſea, of conſiderable altitude. They conſiſt of numerous ranges of baſaltic columns, which moſtly obſerve a northern direction, forming the land that is interpoſed betwixt them into terraces of various extent. The ſoil upon theſe rocks is moſtly of a dark colour, inclining to ſand; and the extent that is cultivated bears no proportion to the quantity that might profitably be ſubjected to the plough. In many places the ſoil is too thin; and, in others, the baſaltic rocks jut through the ſurface of the land. In ſeveral places, rills of water have expoſed banks of red clay marl, which is well adapted to correct the defects of the ſoil.

Beyond theſe rocks we deſcend into a beautiful plain, which is part of a farm called Kildonan, belonging to the Marquis of Bute. At the lower extremity of this plain, on the ſea-bank, are ſituated the ruins of Kildonan Caſtle, which, when entire, has not been without magnificence.

Beyond

Beyond Kildonan is ſituated the extenſive vale of Auchinhew, which hangs towards the ſouth; is bounded by the Struey rocks on the ſouth-weſt; and extends far back to the baſe of Knocklecarleu on the north.

This vale is interſected by numerous deep ravines, formed by ſtreams of water. In ſome places the ſoil is of a deep red colour, and then contains too great a proportion of clay. In moſt caſes it is of a whitiſh red, or browniſh colour, and contains too much ſand; but, in ſuch caſes, the ravines exhibit deep banks of red clay marl, of various, though generally of excellent quality.

Oppoſite to Auchinhew is ſituated the beautiful iſland of Plada, the property of the Marquis of Bute, having a channel of about a mile in breadth interpoſed betwixt it and the Mainland.

The ſea-beach, towards the Dipping Rocks, exhibits ſtrata of red ſandſtone, interſected by numerous veins of whinſtone. The Dipping Rocks riſe abruptly from the ſea. They may be about three hundred feet perpendicular, and are compoſed of rudely columnar baſalt, moſtly of the arenaceous ſpecies, and frequently exhibit ſpecks or ſtreaks of a ruſty colour. In one place the ſea has ſcooped out a very curious natural arch, detached from the body of the rocks. The baſaltic columns are frequently interſected by veins of baſalt, differing in ſpecies from themſelves. Some of

of theſe are fatiſcent whinſtone; ſome contain concretions of zeolite; others of ſpar of lime. Theſe veins interſect the columns to their ſummits.

Here, the eroſion of one of theſe veins has formed a narrow aperture, through which a burn is projected from the ſummit of the rocks; which, when ſwelled by rain, forms a ſuperb caſcade, ſpouting far beyond the baſe of the rocks. This caſcade forms a land-mark to ſeamen, and is by them called *the piſſing mare.*

Further ſouth, the baſaltic columns reſt upon a ſtratum of ſoft white ſandſtone; below which, ſtrata of red and white ſandſtone alternate, until they are concealed from view.

On the north ſide of the plain of Kildonan, large and broad veins of whinſtone have been ſcooped out by the ſea, ſo as to form a hollow through the ſtrata, which is uſed as a harbour for fiſhing boats, and for embarking cattle, ſheep, &c. The ſouth ſide of this harbour exhibits an extenſive plain, very little below high water, and almoſt perfectly horizontal. When the tide has retreated, this plain exhibits a ſort of moſaic work, being divided by cracks into figures generally of five ſides; though there are many irregularities, ſome of which ſeem to have been produced by the agitation of the ſea. Where the ſea has cut into this plain, it is ſeen to be compoſed of ſtrata of baſaltic columns, the uppermoſt ſtratum apparently from

from ſix to eight inches in altitude; the others varying from one to three feet, until they are loſt in the ſea. Theſe columns are not jointed into each other, as happens with the moſt perfect ſtrata of baſaltes; but they are divided, by horizontal planes, into ſtrata of uncommon regularity.

Southward of the ſubmarine plain juſt deſcribed, there are ſeveral lower plains, compoſed of the ſame materials, with thin veins of whinſtone occaſionally jutting above them. Theſe ſeem to have been formed, from the ſea having removed the upper ſtrata; which, in this place, were perhaps leſs compact, and leſs able to endure its attacks, than their more fortunate neighbour towards the north.

The ſea-bank around Kildonan varies in altitude from about twelve to twenty feet. It is moſtly compoſed of ſuch columns as have been deſcribed; in ſome places exhibiting great regularity; but in moſt caſes much confuſion. This baſaltic ſtratum evidently reſts upon thoſe within tide, and probably may have covered them far beyond the extent where they are now viſible. Kildonan ſea-bank forms a ſort of ſemicircle, which can eaſily be accounted for from the expanſe of ſea which breaks upon it from ſouth-eaſt and north-eaſt, and the hardneſs of the ſubmarine ſtrata in front. But though its baſaltic ſtrata evidently extended much further than they now do, they ſeem not to have been

been able to reſiſt the ſea, which has reduced the bank into its preſent form.

Beyond Kildonan, the ſtrata reſume the qualities ſo often deſcribed. They are red ſandſtone, often alternating with white, and much oftener alternating with red ſhiver, or ſchiſtus; ſometimes alſo with red or white ſandſtone ſhiver, or ſchiſtus.

Along the ſea-beach numerous whinſtone veins interſect theſe ſtrata; and theſe appear through their whole extent, though, on the ſea-beach, they are better ſeen than in a glen. Here the veins run in various directions; ſometimes they are ziz-zag, ſometimes curved; ſometimes they croſs each other; and the larger, as far as I obſerved, cuts off, or terminates the ſmaller.

Near the mill there is a vaſt congeries of veins, ſome of which ſtand like walls above the ſurface. Among theſe, it would be eaſy to conſtruct a ſafe harbour for fiſhing boats. Theſe veins are moſtly compoſed of wacken, or of wacken porphyry: though ſmaller veins interſect or run parallel to the former, compoſed of whinſtone of various qualities.

In one of theſe veins, which runs parallel to the others, the hard dark blue whinſtone is ſuddenly cut off by the fatiſcent, which decompoſes in concentric layers; and exhibits much ſoft matter, of a dark colour, with numerous hard round-

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ed nodules, ſurrounded with ruſty cruſts, intermixed.

Theſe two ſpecies of matters, which fill the ſame vein, are ſeparated by a croſs vein running in a very irregular manner, ſometimes zig-zag, ſometimes curved, and its breadth varying from about one fourth to more than an inch. This croſs vein, which ſeparates the contents of the great vein, is pitchſtone, approaching to obſidian, as black as jet, very brittle, and its fracture concave. At firſt inſpection, it is not poſſible to diſtinguiſh it from ſome ſpecies of candle coal, for which I at firſt miſtook it.

I could not trace this croſs vein beyond the great vein which it interſected. But here the ſea has moſtly made its inroads into veins of fatiſcent whinſtone, which are ſuddenly terminated by materials, in the ſame vein, more able to reſiſt its attacks. In the caſe alluded to, the hard materials were towards the ſea, and the ſoft towards the land; and the latter were ſcooped out into hollows, generally lower than the part towards the ſea.

I wiſh our fiery philoſophers, who allege that whinſtone veins were projected in a liquid form from the bowels of the earth, would have the goodneſs to explain, how veins, running parallel and contiguous, ſhould be filled with matters ſo very different in their quatities; but, more particularly,

cularly, how the matter in the ſame vein ſhould be ſuddenly changed; and how a croſs vein, ſo very different in quality from the matters on either ſide of it, ſhould form the line of ſeparation between the very different materials occupying the ſame great vein? To get all this accompliſhed, theſe fiery gentlemen muſt have their great agent reduced to mathematical rules; and heat muſt operate in direct oppoſition to all our experience of its effects.

Among theſe wacken veins, there are ſome veins of whinſtone, which ſtand above the ſurface like perpendicular walls, and their parts exhibit a rude approach to the cryſtallization of the garnet. Some of theſe latter veins continue their progreſs through the ſtrata which compoſe the ſea-bank; and are ſeen ſometimes in great magnitude, croſſing the burn which runs paſt the mill of Auchinhew, oppoſite to Plada.

On ſcrambling up this burn, found ſuch ſtrata as have been deſcribed; and in many ſtrata of red and white ſandſtone, or clay ſhiver, rounded nodules of limeſtone, ſome white, ſome red, and ſome variegated with both colours, of various ſizes, and arranged in regular beds, or interſperſed among the ſhiver.

Tracing this burn to the ſecondary mountains from which it flows, we find that, near its deſcent from theſe, having formed a caſcade, it has ſcooped

ed out a horrible chaſm, and has expoſed a very magnificent diſplay of the ſtrata.

After examining theſe below, and ſcrambling to their ſummit, I ſhall begin their deſcription with the ſtrata on the north ſide, a conſiderable way below the caſcade, where they are expoſed for more than three hundred feet perpendicular.

There, the ſtrata which riſe above the burn conſiſt of very thick beds of red ſchiſtus and ſhiver; in the compoſition of which, ſometimes clay, ſometimes ſoft ſandſtone, predominates; and the ſame ſtratum often contains confuſed mixtures of both theſe ingredients. The thick ſtrata now deſcribed often alternate with ſtratulæ of red, and ſometimes white ſandſtone.

Above the higheſt red ſtratum, there is a ſtratum of white ſandſtone. Upon this reſts a very thick ſtratum of baſalt, in pretty regular columns, moſtly of five ſides, and exhibiting zeolitical concretions. Upon this, again, reſts a confuſed ſtratum of baſalt, though it affects the columnar form. Above this, an irregular ſtratum of white ſandſtone. Upon this reſts a ſtratum of dark-coloured columnar baſalt. Next, arenaceous baſalt, of a whitiſh colour. Above that, dark columnar, ſimilar to the former. Above all, a ſhivery ſort of ſandſtone.

The columns of baſalt ſtand perpendicular; and the three laſt mentioned ſtrata of them can be

diſtinguiſhed, by difference of colour, from a great diſtance. The three ſtrata are divided, by perpendicular cracks, into columns of five ſides, and poſſeſſing conſiderable regularity; ſo that the whole ſeries of ſtrata form only one column; that is, the perpendicular cracks divide the three ſtrata into columns from top to bottom. But the columnar ſtrata themſelves are ſeparated by horizontal cracks, in ſome parts ſcarcely viſible, interſecting them horizontally, according with the lines of their colour; and thus forming them into three ſeparate ſtrata.

After ſcrambling over broken columns in the channel of the burn, with great difficulty and danger, I reached the fall of Eſſiemore, (*Great Fall*, as I was told.) This fall, or caſcade, much exceeds a hundred feet perpendicular. It flows over the laſt mentioned ſtrata of baſalt, which have prevented it from ſcooping a deep channel above; though it has made horrid havock with the ſofter ſtrata below. A broad whinſtone vein, compoſed chiefly of dark-coloured, but hard and rounded maſſes, immerſed in ſofter matter of the ſame colour, and both exhibiting the ſame qualities, forms the perpendicular face of the fall. This vein penetrates ſuch ſtrata as I have deſcribed; and when it approaches the ſtrata of baſaltes, it divides into two branches, like the letter V. At the junction with the baſaltic ſtrata, it is wholly cut

cut off. Though numerous veins penetrated the ſtrata in the lower parts of the country, this is the only vein I obſerved penetrating the ſtrata now deſcribed, or which did not interſect the ſtrata to their ſummit.

The ſouth ſide of the chaſm below the caſcade, exhibits a perpendicular wall of great altitude, being a continuation of the three ſtrata of baſalt already deſcribed on the north ſide. The only difference is, that the ſtratum of white ſandſtone, on which the columns reſt, is of much greater thickneſs than the ſame ſtratum on the north ſide of the chaſm; though the eye can diſcern no difference in the thickneſs of the ſtrata of baſalt on either ſide.

On the ſouth ſide, the white ſandſtone is the only ſtratum viſible below the columns, thoſe below being covered by fragments. It reſiſts all attacks of the weather; is of very fine grain, very ſoft, and eaſily cut with the knife.

Below the fall, the burn has undermined the ſofter ſtrata, deſcribed as viſible on the north ſide, below this range of columns. The effect of this has been, the ſcooping out the horrible chaſm alluded to, and the fall of immenſe maſſes of columns. Theſe fallen columns form two ſeparate hills of columns, with their ſummits moſtly pointed towards the ſouth, and facing the caſcade. Between the hills are many columns, ſcattered with

the utmoſt irregularity. Theſe muſt have been ſplit off by froſt, or have fallen individually; but the hills of columns muſt have been undermined by the burn, and then have ſlid down to their preſent poſition, in maſs.

On tracing the country backwards, almoſt to its higheſt elevation, I found ſhattery priſmatic whinſtone, often forming blotches, and ſometimes tumuli, or little hills. In ſome places it ſeemed to reſt upon the ſandſtone deſcribed as forming the roof of the ſtrata already detailed; in others, it ſeemed to be the ſummit of whinſtone veins. But as ſtreams of water, here ſluggiſh, afforded no opportunity of aſcertaining this point, I ſhall leave it where I found it.

I may venture to ſtate that, in a particular poſition, with a vivid ſun at my back, and the caſcade of Eſſiemore in front, I enjoyed a beautiful iris, which was a perfect circle; and, by varying my poſition, it varied from a circle, and faſhioned its drapery, in the lower parts, ſo as to inveſt the ſtones in the chaſm below the caſcade. This phenomenon was produced from the refraction of the rays of light, by the particles of water, or ſpray, projected from the caſcade.

Here, the cautious obſerver muſt be ſtruck with the remarkable horizontality of the ſtrata I have attempted to deſcribe. In the lower grounds the ſtrata dip with various, and always form conſiderable,

ſiderable, angles with the horizontal plane. But here the ſtrata are almoſt perfectly horizontal; and, with the utmoſt vigilance, I could only detect a very gentle riſe in the ſtrata towards the north-eaſt.

At a ſmall caſcade (now dry) which falls over the rocks, forming the ſea-bank, ſouthward of Auchinhew burn, there is a conſiderable congeries of ſtalagmites, and petrifactions of lime. A hill has been formed by the fall of theſe ſubſtances from the face of the rock, on which they are formed. Were this hill dug into, it might furniſh a conſiderable maſs of theſe ſtalagmites and petrifactions, which yield excellent lime. The face of the rock, through a conſiderable extent, exhibits a calcareous incruſtation, which makes it look like limeſtone.

This fact indicates a conſiderable ſtratum of limeſtone, concealed ſomewhere behind; from which the matter compoſing theſe incruſtations, &c. had been conveyed, by ſolution, in exceſs of carbonic acid, and afterwards depoſited, when the exceſs of acid, which cauſed the ſolution, was evaporated by expoſure to air. But though I climbed the bank, and endeavoured to find the ſtratum from which theſe ſtalagmites, &c. were waſhed, I did not ſucceed, the ſtrata being here concealed by the ſoil.

Still further ſouth, and near the riſe of the Struey Rocks, a conſiderable burn has ſcooped out a narrow and dark chaſm in the rocks which form the ſea-bank, in the back ground of which it forms a very high and perpendicular caſcade. This caſcade is called *Levencorrach*, or *Black Dog's Fall.*

Tracing this burn to the mountains from which it deſcends, found a more grand diſplay of the ſtrata than thoſe deſcribed towards the north. At Eſcoom (*Narrow Fall*), the water has ſcooped out a chaſm, through the ſoft ſtrata, of ſeveral hundred feet perpendicular, in the boſom of which it forms a caſcade more than a hundred feet perpendicular.

Theſe ſtrata conſiſt of ſandſtone, red ſhiver, indurated whitiſh blue clay, with nodules of limeſtone interſperſed. The caſcade is projected from a pavement of hard blue baſalt, whoſe freſh fracture exhibits ſmall ſparkling points. This baſalt forms a regular ſtratum, about three feet in thickneſs; and it is ſubdivided, by vertical fiſſures, into columns. The baſalt has red ſhiver both above and below it; and theſe ſofter ſtrata are continued to the top of the mountain, where they are covered by a range of rude baſaltic columns.

Numerous baſaltic veins penetrate the ſoft ſtrata below; but I did not obſerve any of them riſe above the ſtratum from which the caſcade is projected.

jected. Theſe ſtrata ſcarcely deviate from the horizontal level.

On climbing the ſteep ſhoulder of the hill, on the ſouth ſide of the caſcade, found an extenſive ſwamp behind, which has formerly been a deep lake, but has been drained, in conſequence of the burn having ſcooped out its preſent deep channel.

The ſummit of the iſland, here, is occupied by blotches, or jutting rocks, of rudely columnar baſalt, which reſt upon ſandſtone. A high range of baſaltic columns runs ſouthward from this ſummit to the ſea, and forms the eaſtern face of the Struey Rocks. This range, where its baſe is viſible, is alſo ſeen to reſt upon ſandſtone, and ſuch ſtrata as have been deſcribed, which are here inclined towards the ſouth.

The iſland of Plada, contiguous to this diſtrict, is about a mile from the neareſt point of Arran. It is a low and flat iſland, and contains about ten acres of excellent paſture. An elegant lighthouſe has been conſtructed upon it, conſiſting of reflecting lamps, which are kept in excellent order.

The whole iſland conſiſts of a ſtratum of baſaltic columns, moſtly of the arenaceous ſpecies. On the eaſt ſide, theſe columns are ſeen to reſt upon white ſandſtone. This, again, reſts upon numerous ſtratulæ of limeſtone, conſiſting of rounded blocks, imbedded in red, or white calcareous ſhiver, or marl. Theſe ſtrata are not ſeen percep-

tibly to deviate from the horizontal plane. They are interſected by numerous veins of whinſtone of various ſpecies, which ſometimes, though ſeldom, are alſo ſeen to interſect the columnar ſtratum of baſalt to its ſummit.

STRUEY

STRUEY ROCKS, &c.

AMONG the Struey Rocks there is a conſiderable hollow, where ſome farms are ſituated; but much more land might be gained than is actually cultivated.

Advancing along the ſea-beach, theſe rocks preſent bold cliffs, of various altitude, but ſome from four to five hundred feet perpendicular.

Theſe cliffs are compoſed of baſalt, in ſome places exhibiting columns of conſiderable regularity, moſtly pentagonal; in others a confuſed maſs; and in other parts the perpendicular face of the rock is variegated by vertical cracks, which ſhew a tendency towards the columnar form. The columns are dark blue; or whitiſh, when of the arenaceous ſpecies. Both frequently exhibit numerous round concretions of zeolite; and the confuſed baſalt often exhibits concretions of prynnite, or ſilicious zeolite. The dark blue columns ſometimes aſſume a white cruſt; and in their interior fracture exhibit cryſtals of fell-ſpar as black as jet. But what ſtruck me moſt, were pieces of ſlate, of a dark blue colour, and of ſeveral inches area, ſticking in ſome of the arenaceous columns.

This

This ſeems to confirm an opinion the late Dr Walker entertained, of the identity of baſalt with ſchiſtus, or ſlate; and that the former had been formed from matter waſhed off from the latter, and afterwards depoſited.

Theſe rocks are interſected to their ſummits by ſeveral veins of whinſtone, of a different colour and ſpecies from themſelves.

In a place where the rock forms a receſs, one of theſe veins appears not a little remarkable, from its figure, and the conſequences which ſeem to reſult from it. Its figure is that of a perfect wedge, or elongated iſoſceles triangle, whoſe baſe is at the ſummit of the rock; and it terminates in a ſharp point, or edge, about fifteen feet above the bottom of the rock. The ſides of this vein are whitiſh arenaceous baſalt, with no perceptible tendency towards a columnar form, and are very regular. Part of the vein, at its ſummit, is empty, the matter that filled it having been decompoſed and carried off. The firſt matter that appears is fatiſcent whinſtone, conſiſting of rounded blocks, diſſeminated among ſoft matter. Below this, the whole vein, to its bottom, is filled with pieces of hard and dark blue whinſtone, of equal thickneſs, and built upon each other with all the regularity of the moſt perfect ſtratification. Theſe pieces have their ends cut off, ſo as to fit exactly the

ſides

ſides of the vein; and the whole ſeries of pieces exactly fills up the iſoceles triangle, or wedge.

The concluſion that ſeems to reſult from this fact, is, that baſaltic veins do not deſcend to an unlimited depth through the ſtrata of the earth; and that they have been formed from matter conveyed into cracks and fiſſures of the ſtrata from above, in place of being projected up through the ſtrata in a liquid form, from a great depth below, according to the igneous theory of their origin.

To the ſouth of this place, the ſea has ſcooped a vaſt cave, called the Black Cave, into a large vein of ſoft wacken; the mouth of which may be about eighty feet high; its breadth about forty feet; and its length, until it is encumbered with large ſtones, may be about a hundred feet. The ſtones which encumber the bottom of the cave, have fallen down from the rocks behind, where an opening, like a pit, riſes to the air above. The ſides of the cave are ſupported by rude baſaltic columns.

Overpowered with the fatigue of ſcrambling along the rugged ſea-beach, where not a breath of air was ſtirring, and the ſun ſhot forth all his rays, his heat augmented by reflection from the rocks; while I reſted my wearied limbs in the bottom of this cavern, the ſea appeared before me as ſmooth as a mirror; and the ſuperb rock of Ailſa was directly

rectly in front, like a vaſt balloon ſeen through an avenue; while a column of white miſt, hovering on his ſummit, exhibited a lively repreſentation of a volcanic eruption.

Here I began to meditate how a man might contrive to live in this place, ſecluded from human ſociety, and converſing only with the ſublime of nature, or with nature's great Author. The banks on either hand of theſe rocks, might furniſh him with abundance of nuts, of berries, of plants and roots, to gratify his hunger. The ſea would be his fiſh-pond, where, by an eaſy contrivance, he might take what quantities of the finny tribes were neceſſary for his ſubſiſtence, and repay the tribute they yielded him, by furniſhing them with abundant food. His clothes he might weave of the bark of trees, or of the benty graſſes, which grow upon the ſea-beach, into which, like the South Sea iſlanders, he might entwine the feathers of ſea-fowls; which would not only ſhelter him from cold, but defend him from rain. His bed would be moſs and leaves, in ſome convenient ſhelve of the rocks; and his drink the pure water which trickles from the bottom of the cavern. Here, dead to ambition, and unannoyed by the folly of mankind, our philoſopher might live only to improve his mind, and to prepare himſelf for heaven.—But while occupied with theſe cogitations,

tions, I figured ſome ſuch ſtorm as had ſcooped out this cavern, which would blow our philoſopher and his ſpeculations up through the pit that deſcends from the ſurface behind. The concluſion was, that ſociety is preferable to ſolitude; and that it is our duty to do good to mankind, even though, inſtead of duly appreciating our ſervices, they ſhould miſrepreſent and counteract our good intentions.

Contiguous to this cave, granitic porphyry * commences, and occupies the ſea-beach, until it is intercepted by ſandſtone, and other ſoft ſtrata. In fact, it forms a range of rocks, of various altitude, which runs acroſs the country, nearly north by weſt, until it is interſected by the ſecondary mountains.

That my reaſon may appear for diſtinguiſhing this variety of porphyry, ſo different from all others I have obſerved, by the name of *granitic*, I ſhall attempt a general deſcription of it; and ſhall note the deviations from its general character as they may happen to occur.

Sometimes it is arranged in huge blocks, of various ſize, and exhibiting great irregularity in their poſition; but always exhibiting, or affecting, a quadrangular form. Sometimes arranged in horizontal ſtrata, conſiſting of a great number of quadrangular

* See Note [N.]

quadrangular columns of the ſame altitude. Sometimes, like ſmall grained granite, it forms a confuſed irregular maſs; and, in this caſe, its concretions are often ſmall, and its fell-ſpar frequently decayed.

Its ſubſtramen, or ground, is arenaceous, apparently granitic ſand concreted, in which are inſerted numerous cryſtals of fell-ſpar and quartz. The colour of the ſubſtramen various; ſtrikes fire with ſteel; very hard; reſiſts the chiſel; its fracture, in the ground, inclining to the plane, but rough.

Its concretions are fell-ſpar and quartz, of various, but often of conſiderable ſize. Theſe cryſtals have their angles worn off, and are always more or leſs rounded. The fell-ſpar commonly breaks on the ſame plane with the ground in which it is inſerted, and is commonly of a dull white colour, without any of the ſparkling appearance exhibited by the freſh fracture of the fell-ſpar in granite; ſhewing that it had been water-worn, and expoſed to decompoſition, before it entered into its preſent combination. The quartz are commonly of a ſmoky colour, ſuch as abound in the granitic mountains of Arran. They have evidently been perfect cryſtals, but have had their angles worn off by attrition in water. After fracturing the ſtone, their ends often ſtick out beyond the ground, leaving correſponding hollows on the oppoſite chip.

The

The primary ſoil upon theſe rocks is commonly thin, and every way ſimilar to that upon granite. It is mooriſh, or moſſy, at the ſurface; white below; and the ſubſoil exhibits granitic ſand, often interſperſed with fell-ſpars and quartz, ſuch as they appear in the original rock. It is often encumbered with detached maſſes of the rock; and frequently the ſolid rock juts through its ſurface.

This variety of porphyry differs ſo much from every other ſpecies of porphyry I have yet ſeen, that, in order to diſtinguiſh it, I have called it *granitic porphyry*, becauſe it differs in no reſpect from granite, except that it has a ſubſtramen; of which granite has none that is viſible. The rounded figure of its concretions, ſhews that it once had been granite, making a part of the granitic mountains of Arran; but the granite having the adheſion of its cryſtals deſtroyed, they were conveyed into their preſent ſituation by attrition in water, and afterwards reconſolidated into rocks not leſs hard than granite.

Immediately contiguous to the Black Cave, granitic porphyry commences, and occupies the ſea-beach for a conſiderable extent. It generally affects the columnar form; but is frequently arranged in huge maſſes, without any apparent regularity. It is frequently interſected, from top to bottom, by whinſtone veins. Its concretions are of various, and ſometimes of conſiderable ſize.

Often

Often the ſubſtramen, or ground, exhibits a brown, or ruſty appearance.

But what is ſtill more ſingular, though not mentioned before, a great part of the baſaltic rocks already deſcribed, is covered with granitic porphyry, moſtly arranged in rude maſſes, like that under conſideration. In theſe caſes, the veins which interſect the baſalt, interſect alſo the porphyry to its ſummit.

This may throw ſome light on the ſucceſſive formation of theſe rocks. Firſt, the ſandſtone ſtrata on which the baſalt reſts, though they are dipped from view on the ſea-beach, had been formed. Over theſe the baſaltic ſtrata had been thrown; and above all the porphyritic. The gradual conſolidation of theſe ſtrata has left cracks, or chaſms, which have afterwards been filled by whinſtone veins.

SOUTH-END.

FROM the Struey Rocks to the Brown Hills, there is an extent of more than ten miles. Here the mountains towards the north-eaſt retire to an almoſt imperceptible diſtance; and, allowing for ravines, and other obſtacles, there are much more than 20,000 acres, either cultivated, or capable of being cultivated with profit.

The ſoil here is generally ſuch as I have frequently deſcribed. It is moſtly a browniſh, or reddiſh clay. Where of a deep red, it is not ſo good, though capable of correction. In many caſes ſand predominates; but, in ſuch caſes, the ravines expoſe immenſe banks of reddiſh clay marl, of various, and often of good quality. Where alluvial ſoil has not been conveyed over granitic porphyry, the primary ſoil is ſuch as I have attempted to deſcribe.

The general character of the ſtrata is red, and ſometimes white, ſandſtone, or puddingſtone, often including large beds of red, and ſometimes white, clay ſhiver, or ſandſtone ſhiver. Theſe ſtrata are variouſly interſected by whinſtone veins.

Along the ſea-bank, from where the granitic porphyry terminates, to the brown rocks, ſand-

ſtone ſtrata, moſtly of a red colour, and alternating with ſhiver, prevail. In the latter are many ſtratulæ, and rounded nodules of limeſtone, in beds, or interſperſed; but none which ſeem to merit attention. Frequently, alſo, ſtratulæ or nodules of argillaceous ironſtone, of a red colour, though few of great purity, are viſible.

In one place, the red ſtrata are interſected by a compartment of pure white ſandſtone, of a very fine grain, and ſuſceptible of the higheſt poliſh of which that ſtone is capable. This compartment occupies the ſea-beach, which is here dangerous to be approached by veſſels; but if the exportation of this ſtone were found profitable, a harbour might be formed by digging it below tide-mark. What was taken out of the rut intended for a harbour, would more than repay the expenſe of its excavation.

Further on, where the ſea-bank is bold and lofty, a great maſs of calcareous incruſtations and petrifactions, are ſeen adhering to the face of the rock, and numerous fragments of theſe ſubſtances have rolled down to the ſea-beach. A large green hill ſeems loaded with powdery calcareous matter, and with fragments which have fallen from the rock above. The powdery matter might be uſed as marl; and the fragments might be burnt into lime of very ſuperior quality.

This

This calcareous matter muſt be conveyed by ſolution from ſome limeſtone rock ſituated ſomewhere behind: but after climbing the bank, I ſaw that the ſtrata were covered with cultivated ſoil; and no limeſtone was viſible in any of the contiguous burns.

Along this coaſt the whinſtone veins are very numerous. They generally penetrate the ſandſtone ſtrata on each ſide, or form very hard veins of ſandſtone, running parallel to them, which are ſeparated from the horizontal ſtrata by fiſſures, or cracks.

The moſt remarkable of theſe veins are at Cletiemore, below the farm of Sliddery. Here they are ſeen to jut above the ſurface, like perpendicular walls; and form a harbour for ſmall veſſels, which might eaſily be rendered commodious.

The harbour is formed by two veins, the one of baſalt, the other of whinſtone. The baſaltic vein runs nearly from eaſt to weſt, and interſects the other, which runs nearly from north to ſouth, at right angles. The baſaltic vein is compoſed of four ſided columns, the ſides from four to five inches, laid perfectly horizontal, in the direction from north to ſouth, at right angles to the direction of the vein. This vein, or the length of the quadrangular pieces of which it is compoſed, may be about twelve feet in thickneſs. The columns (if columns they can be called when in a hori-

zontal poſition) adhere to each other, the angle of one exactly fitting the angle formed by the junction of two others; and their ends form a perpendicular wall on each ſide, which defends the ſmall bay, or harbour within, from the violence of the ſea. They have every appearance of quadrangular ſpars of wood built up in a wood-yard. A narrow paſſage cut through this vein, admits veſſels into the harbour.

The matter of which this vein is compoſed, has externally the gloſſy appearance of pitchſtone; but internally it is found to be hard dark blue baſalt; its freſh fracture exhibiting numerous ſparkling points.

The vein from north to ſouth is a coarſe grained whinſtone, containing numerous concretions, of various ſubſtances, and is more than thirty feet in thickneſs. On the beach, it firſt becomes curved, and is ſoon cut entirely off by a vein from north north-weſt, which forms a high wall upon the ſea-beach.

The baſaltic vein cuts through the one from north to ſouth, without any communication of ſubſtance; only, on the north ſide of it, there is a ſmall cruſt, or vein, of the ſame matter as the whinſtone vein, interpoſed betwixt them. On the ſouth ſide, there is interpoſed betwixt the baſaltic and whinſtone veins, a vein of about a foot in breadth, compoſed of rounded nodules, of the ſame materials

materials with the interfected vein, faſtened in a cement of the ſame; though the cement is ſofter than the nodules. In fact, this is a true vein of whinſtone pudding, running parallel to the baſaltic, or interfecting vein.

Paſſing on until we reach the ſea-beach below the farm of Corrychrevy, we there find a natural harbour, called Haddock Port, defended (as I was told) by a bank called the *Iron Iſland*, which was ſaid to be uncovered at half tide; though the tide happened to be too high, all the times I was there, to render this iſland viſible. Between the iſland and the natural harbour, there is ſaid to be a deep channel, with good anchoring ground, where veſſels may ride in perfect ſafety.

This is the ſouth-weſtern extremity of Arran, being the point oppoſite to its north-eaſtern extremity; and if a good harbour were conſtructed here, it would tend much to improve the moſt improveable diſtrict of Arran.

Beyond this harbour there is an extenſive flat, very little elevated above high tide. It is a ſwamp, and uſed only for cutting reeds, and other aquatic graſſes, to prevent cattle from ſtarving during winter. Were this ſwamp only drained, which might be done at a ſmall expenſe, it would throw up graſſes of great value; or might be ſubjected to the plough.

On the ſea-bank north of the harbour, there is a round detached hill, very ſteep on all ſides, and connected with the mainland by a narrow neck. This hill is called *Torchaſtel (Caſtle Hill.)* On its ſummit, there is a circular foundation of an ancient Daniſh fort, compoſed of large ſtones, without cement. There is alſo an outwork, of the ſame materials, to defend the narrow entrance from the land.

From the ſuperſtitious veneration the people ſhewed for this place;—their notions of its being inhabited by fairies and ſpirits, beings whom they eſteemed wholly inclined to miſchief, though no one could condeſcend on any ſpecific harm which theſe animals had done;—from the circumſtance, that every place, where religious rites were performed before the introduction of Chriſtianity, continues ſtill to be an object of fear and apprehenſion, from Arran to the Orkneys,—I inferred that this hill was not only a fort, but alſo a place where the Scandinavians, who poſſeſſed this iſland, worſhipped their ſavage and brutiſh god Tor, or Thor.

The word *Tor*, in Gaëlic, means ſomething that riſes boldly upwards; and is applied to many hills, throughout the Highlands, which are rounded, precipitous, and reſemble a heap of hay. I ſuſpect the word is not indigenous in Gaëlic, but to have been derived from the Scandinavian language, and to be now applied only to thoſe hills where

where theſe people worſhipped their worſe than brute of a God.

In the ravines contiguous to this fort, there are vaſt ſtrata of florid red clay, well adapted for making bricks, and all the coarſer earthen utenſils, of ſuperior beauty.

On reaching the ſolid rock at the baſe of the Brown-hills, (their Gaëlic name means *Brown-head*, from their projection into the ſea), I found them compoſed of granitic porphyry. It ſometimes affects a columnar form, and is compoſed of blocks, of various dimenſions, many of which are very large, though they are of all magnitudes; and all are either quadrangular, or affect the quadrangular form. In other places, this ſtone is arranged in ſtrata, of various thickneſs, which riſe towards the north at an angle of about 80°. Other parts are compoſed of vaſt maſſes, which ſeem to form veins through the ſtratified parts; and are every way ſimilar to thoſe blocks deſcribed as interſecting the ſtratified granite. Some of this ſtone has aſſumed a yellowiſh red tegmen, or cruſt, which has occaſioned the name given to the hills. But the recent fracture diſcovers no difference of colour between thoſe which have a brown, and thoſe which have a grey tegmen.

Many parts of this ſtone exhibit few or no particles of felſpar; but diſplay numerous ſmoaky cryſtals of quartz, often of conſiderable ſize, in-

ſerted in a jaſpidean ground, and always having their points and angles worn off.

This ſtone ſeems very durable; and, furniſhing quadrangular blocks of various ſize, it ſeems well calculated for the conſtruction of piers and harbours.

Mr Jamieſon, apparently judging from ſtones he found at the mouths of burns, p. 132, ſays, 'The hills back from the ſhore are formed of '*ſcenite*, which is very probably penetrated with 'veins of baſalt, as that at the head of Glen-'Cloy.'

Under *the hills*, Mr Jamieſon ſeems to include the *Brown-hills*; but, though I walked over their ſummits in various directions, and explored moſt of their baſe, I found no other rock than what I have attempted to deſcribe. The ruſty colour on the ſummit of the hill, is produced by the oxygenation of iron in the fellſpar, or rather ground of the ſtone, by the ſame proceſs which occaſions a ruſty appearance in granite. But when either rock is broken to a ſufficient depth, we find no ruſty appearance.

The *Brown-hills* are the only rocks in Arran in which I ſaw no baſaltic veins; and if Mr Jamieſon alludes to other hills, bounding the South-End, I can aſſure him I did not find one ounce of ſyenite in them, except in puddingſtone.

Having

Having deſcribed what occurred along the ſea-ſhore, let us now return, and explore the interior country.

The diſtrict of South-End riſes gradually from the ſea-ſhore to the ſecondary mountains, through an extent of from ten to twelve miles. It may be conſidered as a valley included between the Struey Rocks on the eaſt, and the Brown-hills on the weſt.

This valley is interſected by two main rivulets, viz. Torlin towards the eaſt, and the water of Sliddery towards the weſt. Theſe ſtreams run nearly parallel to each other, from north-eaſt to ſouth-weſt, and receive numerous tributary ſtreams in their progreſs from the ſecondary mountains towards the ſea. Moſt of the other burns, which flow into the ſea, are merely mountain torrents, which are dry, except when they are ſwelled by exceſſive rains. Moſt of theſe burns have cut deep chaſms, or ravines, in the ſtrata; and the main ſtreams have frequently formed delightful vallies, though ſometimes of ſmall extent.

Numerous veins of whinſtone interſect the ſtrata here; and I muſt endeavour to explain the circumſtances in which ſome of them differ from others, of a ſimilar nature, in the iſland.

The moſt prominent feature of many of theſe veins, is an impregnation of numerous cryſtals of pyrites of iron, which, where of ſufficient magnitude

tude to be ſeen, are perfect cubes; and where the magnitude extends to one or two inches, they diſplay cubes inſerted into cubes in a very irregular manner. From the waſhing of aſtringent moſs-water, theſe cryſtals are black externally; and it requires attention to perceive they exiſt in the vein. But when the whinſtone is fractured, they diſcover all the brilliancy of gold, though their luſtre is ſoon tarniſhed by expoſure to air.

Towards the head of Glen Scordel, from which the main branch of the water of Sliddery flows, and in ſeveral other places, there are vaſt veins of whinſtone, interſperſed with innumerable particles of pyrites, which retain their full brilliancy, in ſpite of expoſure to air, and all the aſtringent moſs-water to which they are expoſed. Theſe the people are confident in the belief of being gold; and I confeſs I was a little ſtaggered, until my ingenious friend, Dr Thomſon, by analyzing a ſpecimen, aſſured me that the gold was neither more nor leſs than pyrites of iron.

Other veins diſcover ſmaller, and generally irregular veins of pitchſtone, running parallel, or zig-zagging through them. Sometimes the pitchſtone veins are entirely ſeparated from the whinſtone veins, in which they are included: in other caſes they graduate into each other, ſo that it is impoſſible to ſay where the one begins, or the other terminates. Sometimes you ſee an angular fragment

fragment of pitchſtone inſerted in the whinſtone vein, which mutually graduate into each other. At other times, the fragment of pitchſtone is ſeparated from the whinſtone by planes, ſo that it can be taken out, as a ſtone having no affinity with the whinſtone. Maſſes of whinſtone, of a different ſpecies from the vein, either angular or rounded, are alſo found immerſed in various veins, and either graduating into them, or included, without mutual communication of their ſubſtance.

The colour of theſe veins and patches of pitchſtone, is generally an apple green, though it often exhibits a much darker ſhade. But what ſurprized me moſt, was rounded nodules of pitchſtone, of a jet-black colour, very brittle, their fracture gloſſy and conchoidal, inſerted in veins of pale blue, or grey, whinſtone. The fracture of ſuch nodules has ſince aſſumed a dull green tegmen.

Towards the riſe of the country, I often ſaw broad belts of pitchſtone fragments, including moſt of the varieties formerly deſcribed. Theſe ſhew that large ſtrata, or veins, of this ſtone, exiſt below; though I had not time to trace the ſolid rock.

Towards the upper parts of this diſtrict, there are ſeveral ſtrata of puddingſtone, conſiſting of ſmall rounded pebbles of various ſpecies, ſuch as red quartz, jaſpers, flints, agates, &c. inſerted in a ground of white quartz, which often approaches

to

to calcedony. This ſtone makes the neareſt approach to the true puddingſtone of England, of any I have ſeen in Scotland.

The Water of Torlin, or Lag, expoſes ſuch ſtrata as have been frequently deſcribed. About a mile above the pariſh church of Kilmory, there is a ſteep bank, the lower part of which is occupied by red clay and ſandſtone ſhiver. Upon this reſts a regular ſtratum of rudely columnar baſalt; and, upon that, quadrangular columns of granitic porphyry. The laſt has a greyiſh or yellowiſh jaſpidean ſubſtramen, in which numerous concretions, conſiſting of rounded ſmoke-coloured quartz and fellſpars are inſerted. The fellſpars are generally rounded, and often decayed. The concretions are frequently of a conſiderable ſize; are diaphanous; the ſubſtramen opaque; does not obey the knife; fracture uneven; ſplintery.

Beyond this, the ſame ſpecies of ſtone is continued a long way; but it becomes ſhattery, irregular, or obſerves a very rude ſtratification. It is frequently interſected by veins of fatiſcent whinſtone; and its concretions are generally of ſmaller ſize than thoſe in the columns.

The lower hills towards the ſouth end of Arran commence here, and run in the direction deſcribed of the granitic porphyry, on the ſea-beach. Inſtead of going minutely into their deſcription, which might not be underſtood, I ſhall attempt to throw

throw together a few obſervations, which may ſerve to characterize their general features.

They often exhibit quadrangular columns jutting up through the thin paring of moſſy ſoil. Often, where the porphyry is not columnar, it is ſhattery, and bears the ſame reſemblance to ſandſtone with ſmall-grained granite. In ſuch caſes, where the rock has been long expoſed to the weather, it has acquired a yellowiſh or ruſty colour, from the oxygenation of iron in its compoſition. But where the ſand or fragments of this rock are found in the ſubſoil, they are generally white, owing to the moſſy acids having diſſolved, and carried off the iron in the compoſition of the ſtone. The ſame remark is generally applicable to granitic ſand, or fragments, forming a moſſy ſubſoil. In both caſes, when the fragments are broken into, they generally diſcover a yellowiſh or ruſty nucleus under the white tegmen. The firſt, produced by the action of the atmoſphere on the ſtone, before it was encloſed in a moſſy ſoil; the laſt, produced by the acids in the ſoil having abſtracted the iron which occaſioned the colour.

Several miles above the rock alluded to, and on the ſame river, below Strath-Gaël, there is a regular ſtratum of the granitic porphyry already deſcribed. This ſtratum may be about fifteen feet high, is formed into regular quadrangular columns, and reſts upon horizontal ſtrata of the

ſame

ſame ſpecies, varying in thickneſs from four inches to a foot. The only difference between the columnar ſtratum, and thoſe on which it reſts, is, that the ground of the latter is a ſchiſtic clay, which gives it a bluiſh colour; whereas the ground of the columns is granitic ſand concreted, ſuch as has been deſcribed forming the cement of theſe rocks of porphyry. In all other reſpects, the concretions in both ſtrata, horizontal and columnar, conſiſting of fellſpar and ſmoky quartz, are preciſely ſimilar to thoſe repeatedly deſcribed.

One circumſtance ſtruck me forcibly, *viz.* the remarkable horizontality, both of the ſtrata which form the baſe, and of the columnar ſtratum which reſts upon them.

The hills on each ſide, and particularly thoſe on the eaſt, exhibit range above range of the ſame quadrangular columns of porphyry. The fragments which have fallen, enveloped in heath, have formed terraces which generally conceal the baſes of theſe columns from view. But a friendly torrent on the eaſt had ſwept away the matter which concealed the baſis of the firſt columnar range above the one deſcribed. Here the porphyritic columns were ſeen to reſt on red clay and ſandſtone ſhiver, arranged in ſtratulæ, of which a great depth is expoſed. On climbing a ſteep rock on the oppoſite or weſtern ſide of the glen, I found the ſame ſtratum of columns on the ſame horizontal

tal level with thoſe laſt deſcribed, and reſting on the ſame materials, though here expoſed to a much greater depth.

We have thus got a baſis, conſiſting of horizontal ſtrata of porphyry, with a ſchiſtic ground. Above theſe, a columnar, and very regular, ſtratum of granitic porphyry. Above that, a ſtratum of great altitude, compoſed of ſtratulæ of clay and ſandſtone ſhiver. Above the latter, a ſteep, columnar, and very regular ſtratum of granitic porphyry.

Although I was not able to trace on what the other ſtrata of porphyry, higher ſituated, reſted; yet, from the terraces they exhibited in front, I am entitled to conclude, that they reſted on the ſame ſtrata of ſandſtone and ſhiver on which thoſe deſcribed reſted.

Thus, we have columnar porphyry reſting on horizontal ſtrata of porphyry; and ſtrata of columnar porphyry, alternating with ſandſtone and ſhiver, to the ſummits of the neighbouring hills.

In ſome places, through the range of theſe hills, beautiful caſcades are formed, by torrents flowing over a barrier compoſed of tall quadrangular columns, which are perfectly perpendicular, and the whole ſtratum apparently horizontal. Though I could not ſee on what theſe ſtrata reſted, they commonly exhibited range riſing above range; and I preſume they may be ſtrata of columnar granitic

nitic porphyry, alternating with ſandſtone and ſhiver, as already deſcribed.

On paſſing a certain line, ſandſtone ſtrata again commence, interſected by numerous whinſtone veins. But, on approaching the ſummit of the ſecondary mountains, the ſtrata are found to be arranged in compartments, conſiſting of broad ſtripes of ſhattery whinſtone, with ſandſtone ſtrata interpoſed betwixt them. Theſe ſtripes have every appearance of being large veins, immerſed in the ſandſtone ſtrata. Sometimes the whinſtone forms blotches, which occupy the ſummits of hills.

Whether the zones of whinſtone which interſect the ſandſtone ſtrata, be veins or not, I ſhall not take upon me to decide; but in Alſmourac Burn, which flows from the higheſt elevation of the Struey Rocks, eaſtward from Strath-Gaël, a great zone of this ſort of whinſtone interſects the ſandſtone ſtrata, and is ſeen to reſt on ſandſtone and ſhiver. The other ſtrata are blotches of whinſtone, or whinſtone and ſandſtone, arranged in irregular compartments, where the baſe of the whinſtone is not ſeen. But if this be a vein, and it is very like one, though of large ſize, it confirms an idea, already expreſſed, that whinſtone veins do not always deſcend to a great depth.

Here are alſo numerous ſtratulæ, conſiſting of rounded nodules of limeſtone, imbedded in marly ſchiſtus. There is alſo a regular ſtratum of limeſtone

ſtone in another place; but unleſs it be found of greater thickneſs towards the dip, it is not worthy of attention.

The hills, or rather ſecondary mountains, towards the north of Strath-Gaël, in their aſcent, exhibit the ſame appearances, *viz.* ſandſtone and ſhiver regularly ſtratified, which is often interſected by whinſtone veins. Often, alſo, the whinſtone forms irregular blotches, ſome of which, by the excavations of burns, are ſeen to reſt on ſandſtone. Not ſeldom the ſandſtone is croſſed by parallel ſtripes of whinſtone, ſo as to form regular compartments; and in a few caſes, theſe ſtripes are ſeen to be immerſed in, and to reſt on ſandſtone; giving a very lively idea of veins which penetrate, but do not deſcend far, into the ſandſtone.

In the hill above Auchinreach farm, and others contiguous, theſe appearances are conſpicuous. This hill is ſurmounted by a very thick ſtratum of granitic porphyry, arranged in quadrangular columns, which reſt on red ſandſtone and ſandſtone ſhiver.

The hills here, eſpecially where they approach the primary puddingſtone, are interſected by various, and ſometimes conſiderable veins of ſparry limeſtone. The limeſtone cannot be uſed, becauſe the expenſe of conveying it to land, where it might operate with advantage, would be much

greater than its value. But theſe veins are often marked with blotches, and ſometimes interſected by venulæ of copper ore.

Whether there be any vein of copper here, worth working, can only be determined by a man who pitches his tent among the mountains, and cannot be aſcertained by one who conſumes moſt of the day in travelling backwards and forwards between his quarters and the ſcene of action, and ſeldom gets home without danger of breaking his neck.

From the ſide of Beninuaran (ſaid to mean *ſpringy moor*, or *hill*), an elevated plain is projected towards the ſouth, on which there is an immenſe circular mound of looſe ſtones. This may have been an encampment, or fort, of the Norwegians, when they poſſeſſed the iſland.

In the water of Sliddery, beſides the ſtrata ſo often deſcribed, the only thing remarkable is an extenſive ſtratum of arenaceous baſalt, in moſt places columnar above, but ſhattery and irregular below. The columns are of a greyiſh white colour; and many of their ſides exhibit ochreous concentric rings, of a brown colour, exactly ſimilar to thoſe which appear in many ſpecies of ſandſtone. In ſome places they are regular, like the concentric layers of wood in a tree. In other places they are compreſſed, or contorted; but are always parallel to each other. Obſerved only one

vein

vein of whinſtone, which interſects the ſhattery ſtuff below, but does not penetrate the columnar ſtratum above.

At firſt, I miſtook this ſtratum for columnar ſandſtone; but, on obſerving its hardneſs, its mode of fracture, and eſpecially that its fragments ring, or tinkle, when ſtruck with a hammer, or one piece when daſhed againſt another,—I had no heſitation in referring it to that variety of baſalt which I have diſtinguiſhed by the name of arenaceous.

There are ſeveral other ranges of columnar arenaceous baſalt, not only on the hills contiguous to the upper parts of this river, but alſo on the ſides of burns which diſcharge themſelves into it; though theſe ſeem not to deſerve particular attention.

On the bank above this river, in the lower part of Margreeach farm, there is a grave ſuch as Oſſian deſcribes to be the grave of a hero, and reputed here to be the grave of a giant. Of this giant many ſtories are told, which are evidently fabulous; and he is thought to have lived in the times of Fioun, when moſt people were giants.

The grave is marked by two large ſtones, ſtanding perpendicular, the one at the head, and the other at the feet, their diſtance from eaſt to weſt being about thirty feet. The ſides are alſo marked by ſmaller flags, very neatly faſtened in

the earth, their tops pointing outwardly on each ſide, and forming the ſurface of the grave into a parallelogramic area.

A much ſmaller grave, a little below, and marked preciſely in the ſame way, though ſufficient to hold a very tall man (as we modern pigmies eſtimate human dimenſions), is reputed to be the grave of the giant's dog.

The people talked of a man who dug into the giant's grave, and got out a marrow-bone, into the hollow of which he could thruſt down his foot and leg, as if into a boot. But fearing ſome judgment might come upon him for diſturbing the aſhes of the dead, they ſay he replaced the bone where he found it, and reſtored the grave to its original ſtate.

I have ſeen many graves, in various parts of the Highlands, of extraordinary dimenſions, and reputed to be the graves of giants of the Fingalian æra. They always had ſmaller graves at the feet, reputed to contain the hero's dog. It would ſurely be eaſy to dig into ſuch graves, and aſcertain whether they contain bones of more than ordinary ſize.

The only caſe where I ever could obtain credible information of this being attempted, was with reſpect to the grave of one of the Fingalian heroes, on the ſea-beach, at the bottom of Glenelg. This chief of Skye, in croſſing the ſtrait to join Fioun

in

in a warlike expedition, is ſaid to have been drowned, and his body buried where it was caſt on ſhore. The worthy and reſpectable miniſter of Glenelg, who ſhowed me this grave, aſſured me, that the gentlemen there, of whom he was one, employed ſome of the volunteers, ſoon after laſt war commenced, to dig into this grave, which they found conſtructed internally with great art, and penetrable with much difficulty. After much labour, they at laſt got out a jaw-bone, which, having its pivots applied below the ears of a gentleman, by far the largeſt man then preſent, hung down upon his breaſt, and turned clean over his head. A violent thunder ſtorm having enſued, raiſed much alarm among the people; and they were glad to replace the bone, and reſtore the grave to the condition in which they found it.

In what I have ſtated, I have anticipated what may be more fully illuſtrated, ſhould this work be continued. But the laſt fact, which I learned upon the ſpot, from the moſt reſpectable authority, ſeems to evince, that there were men in former times, a few individuals perhaps, who far ſurpaſſed the preſent dimenſions of the human ſtature.

With reſpect to the grave now under conſideration, I ſuſpect it to have been a long trench, containing the body not of one perſon, but all the bodies of thoſe who may have fallen in ſome conflict; and that the dog's grave may contain

a dog for each of the perſonages whoſe bones are depoſited in the other.

Killing their dogs, and burying them near their owners, was a very natural thought for men who ſubſiſted entirely by hunting, and who believed that the purſuits of a future ſtate were to be every way ſimilar to thoſe which occupied their attention in this.

The old men here have many traditions about Fiûn, and Oſſian, whom they repreſent as the laſt of his race. But as far as I could learn, they rather believe them to have been giants and necromancers, than men of ordinary ſtature, and who acquired celebrity by the exertion of their natural powers.

VALE OF SHISKIN, MACHRY, &c.

THE Vale of Shiſkin is bounded on the ſouth-eaſt by the Brown Hills, and is ſeparated from that of Machry by a low and extenſive moor, which includes ſeveral moſſes. The Vale of Shiſkin may be about ſeven miles in length, from the ſea to the termination of the cultivated land in Glenluig; and from the Brown Hills to thoſe north-eaſt from Machry, may be about five miles in breadth, of moſtly level ground. Were all the land that is capable of cultivation in the plains, and along the riſing ſides of the hills, actually ſubjected to the plough, I ſuppoſe that an area of at leaſt twenty-five ſquare miles might be rendered productive.

The Vale of Shiſkin is interſected by a rivulet called the Black Water, which has cut a paſſage to itſelf through a bar of rocks where it joins the ſea. Here it has formed a ſmall harbour for boats, which is the ferrying place from Campbelton in Kintyre, diſtant about twelve miles. Before the water cut this channel through the rock, the vale behind muſt have been an extenſive lake; and in high floods it ſtill overflows conſiderable tracts of

excellent ſoil, compoſed of rich mud that has been waſhed from the hills. It would therefore be proper to lower this bar of rock, which would coſt nothing, as the ſtones might be uſed for fences, or for conſtructing a proper harbour at the mouth of the river, and to ſtraighten and widen its channel, ſo that it may diſcharge the waters with more rapidity.

The principal feeder of this ſtream is the Clachan Burn (*Stony Burn*), which deſcends from the hills behind the village of Shedog, and commits ſad havock on the cultivated land, by frequently altering its courſe, and throwing over it bowlder ſtones. The only probable way of confining this ſtream would be by a broad belt of willows, aſhes, larches, and ſuch trees whoſe roots form a net-work round bowlder ſtones. Theſe would bind the ſtones together, and confine the ſtream to a particular channel.

The only parts cultivated here are fields along the ſides of the valley, which are naturally dry, and have been formed by the alluvion of burns. The ſoil is of various ſhades, from a dark brown to a brick red colour, and is very fertile where not too much encumbered with ſtones. But the wet parts are generally the beſt ſoil, were they properly drained.

The upper parts of the valley are moſtly occupied with moſs, or with a rich ſoil that has been formed

formed by earth waſhed upon the ſurface of moſs. In ſome caſes, there are very regular and alternate ſtrata of moſs and clay, to a conſiderable depth. In other caſes, on putting down a bore in moſs binks, water ſpouted up with great violence; which ſhews that ſprings have there formed a ſort of ſubterraneous lakes, on which the ſtrata of moſs and clay are kept floating.

Having given a general deſcription of this tract of country, we ſhall next advert to the antiquities which it preſents.

The firſt and moſt remarkable of theſe is an immenſe circular heap of ſtones, or cairn, ſituated on an elevated plain, above the ſea, in the mouth of the valley. Whether this has been a place of interment or not, I cannot pretend to decide; but the general largeneſs of the ſtones ſeems rather to indicate that this had been a Daniſh fort, or encampment, of conſiderable extent. However, the top is a flat area, filled throughout with ſtones, and leaving no appearance of a mound around it. Contiguous to this cairn, there is an extenſive moſs, ſtored with numerous fragments of trees, chiefly oak; which, perhaps, had formerly been a ſacred grove, and the cairn an implement of Druidical ſuperſtition.

Near the village of Shedog, there is a very large artificial green hill, compoſed of earth and rounded ſtones; of a circular form, and having

a flat circular area on its top. It is every way ſimilar to other artificial hills, called *Laws*, in various parts of the country; and may have either been a place of interment, or a place where the Druids decided controverſies, or promulgated laws.

It appears that St Molios had been induced to quit his cave in Holy Iſland, and had long reſided in a little valley, in the mouth of Clachan Glen, where he founded a chapel, and where he died at a very advanced age. His grave is ſhewn in the burying ground, being a ſtone coffin, covered with a flat ſtone, on which the figure of the Saint is not inelegantly cut, in the robes of a mitred Abbot, and having in his hand a lituus, or paſtoral ſtaff.

On the moor between Shiſkin and Machry, many tall obeliſks, called Standing Stones, are ſcattered; and many more have been broken, or have fallen down. Theſe the people believe to be monuments over the graves of heroes, who fell in a battle fought here by Fingal againſt the Norwegians; when, proving victorious, he purſued their broken forces to their fort above Clachland, on the oppoſite ſide of the iſland, and obliged them to leave Arran.

In one place, there are three vaſt ſtones ſtanding, all of red ſandſtone. One is about twenty feet above ground. Three other ſtones have fallen, or have been broken down; all placed in the periphery

riphery of a circle. One of the broken ſtones is a white ſmall grained granite, which had been nearly formed into two millſtones, that had been broken before they were completed. To the weſt-north-weſt is another very tall ſtone, with broken ſtones in the periphery of a circle, of which it makes a part. I doubt not but the other tall ſtones ſcattered through the moor, may alſo be remains of circles.

From theſe circumſtances, I am inclined to think that theſe ſtones are not monuments over the graves of heroes; but Druidical circles, or places of worſhip, ſuch as are found in various parts of the Highlands and Iſles. There are, however, numerous heaps of ſtones, or ſmall cairns, ſcattered here and there, which may have been collected to commemorate the dead.

We ſhall now attend to the foſſils which this diſtrict preſents to our view.

Walking along the ſea-beach, from the mouth of the black water to the vale of Machry, the ſea-bank becomes cliffy, and is compoſed of arenaceous baſalt, which affects the columnar form, or of ſtrata of red ſandſtone and ſhiver, which are generally arranged in compartments, the baſalt not reſting upon, but cutting off or interſecting the ſandſtone. Numerous whinſtone veins are ſeen within tide-mark; though I did not obſerve any of theſe to penetrate the bank.

Below

Below the farm of Drummoduin, (*back of the hill*, or *caſtle*), the ſea-beach is encumbered by banks of blowing ſand, which has deſtroyed a conſiderable extent of land. But on approaching the hill of Drummoduin, a bold and majeſtic cliff, facing the ſea, is preſented to our view. A ledge of low rocks, moſtly covered by the tide, called Drummoduin Point, extends from the ſouth end of this cliff. Theſe are compoſed of a ſpecies of porphyry which has generally a ſchiſtic ground, of a pale blue colour. They are interſected by ſeveral broad and ſtraight veins of whinſtone, moſtly of the fatiſcent ſpecies, which the ſea has ſcooped out, leaving long avenues, in which boats occaſionally find ſhelter.

The cliffs of Drummoduin are moſtly compoſed of baſaltic porphyry, arranged in columns which are generally pentagonal. Theſe columns vary in altitude, from about eighty to a hundred feet perpendicular. They reſt upon a thin ſtratum of very hard baſalt, of a dark blue colour, which alſo, in many places, affects a ſubdiviſion into ſmall columns. This ſtratum reſts upon a regular ſtratum of ſoft white ſandſtone, of a very fine grain, and eaſily cut with the chiſel. Below this, red ſandſtone and ſhiver, with here and there a ſtratum of white ſandſtone, alternate, until the baſe is concealed by the looſe ſtones upon the ſea-beach. The greateſt height of the columns, with the

the ſtrata on which they reſt, above the ſea, may be about three hundred feet.

On turning round the north-eaſt end of this range of columns, and aſcending to the ſummit, ſaw that the ſtrata dipped towards north-weſt, and that the columns decreaſed in altitude towards the riſe of the ſtrata. Thus the columns are evidently a ſtratum ſuperimpoſed on other ſtrata, and differing only from the other ſtrata in the matter of which they are compoſed, and in being interſected by vertical fiſſures.

In the ſtructure of theſe columns, there are ſeveral peculiarities which I had not obſerved before in baſaltic porphyry. They exhibit a confuſed mixture of baſaltic and granitic porphyry. In the body of the columns, maſſes of the dark blue baſalt, on which they reſt, are viſible. In other parts, nodules of the ſame, or nearly ſimilar baſalt, more or leſs rounded, are found immerſed in granitic porphyry, of a grey ground, which exhibits dark coloured and rounded quartz, and a few fellſpars rounded, but leſs ſo than the quartz. In other parts, the dark blue baſalt is impregnated with rounded cryſtals of quartz and fellſpar; but this only happens where the baſalt ſeems to form the principal ground of the column, or appears to be intermixed with a granitic ſubſtramen. No veins were ſeen to penetrate theſe columns, or the ſtrata on which they reſt.

The

The aſcent to this rock from the land is a deep inclined plane; and it is encloſed by a vaſt mound of looſe ſtones, forming a ſegment of a circle from the perpendicular cliff on one ſide to that on the other. It has a gateway in front, on each ſide of which are great heaps of ſtones, which ſeem to have been additional works for its defence. This mound includes ſeveral acres of land, in which are ſeveral ruins of houſes of looſe ſtone, and, were not its name entirely Gaëlic, we might believe it to have been a fortreſs of the Danes when they poſſeſſed this iſland. Had it a ſufficient ſupply of water, it might be rendered impregnable, were it of any uſe to fortify ſuch a place.

North from Drummoduin, the ſea-bank forms a ſpacious amphitheatre. The ſea-beach is interſected by large and irregular veins of porphyry, with an intermixture of baſalt, which form detached rocks upon the ſhore. Beyond theſe, numerous, and moſt irregular veins of whinſtone, are ſeen to interſect the ſtrata of red ſandſtone, in every direction.

The ſea-bank is compoſed of red, and ſometimes white, ſandſtone, with ſtrata of red ſhiver interpoſed, and ſurmounted by a ſtratum of porphyry, which affects the columnar form.

Beyond where the porphyry terminates, irregular ſtrata of pitchſtone are ſeen interpoſed between thoſe of red ſandſtone. This pitchſtone moſtly

moſtly reſembles that at Broddick Wood, being of a dirty green colour, with numerous ruſty maculæ interſperſed, which ſeem to be ſmall fellſpars decayed. Some of it aſſumes a yellow tegmen; and one large ſtratum, of a dirty greeniſh yellow externally, when broken into, exhibited the colour and fracture of yellow bees wax, though it has ſince loſt its luſtre.

On the northern ſide of the amphitheatre, the pitchſtone forms irregular veins, ſome of which terminate at a ſmall depth. In other caſes, irregular veins of whinſtone riſe to the ſummit, parts of which are intermixed with, and others are penetrated by pitchſtone. In other caſes, rounded nodules of baſalt, penetrated by pitchſtone, are found immerſed in the whinſtone. Theſe nodules exhibit a greeniſh white tegmen externally; but internally they are of a gloſſy black colour.

At the projection near King's Cove, is a vaſt body of pitchſtone, which am uncertain whether it be a vein, or ſtratum.

North from King's Cove, a vaſt vein of baſaltic porphyry interſects the ſtrata. Beyond this, numerous veins of pitchſtone are ſeen at ebb-tide. In one place two large veins meet, and the one is cut off by the other. In another place, two vaſt veins croſs each other, and are ſeen, each continuing its direction after croſſing; but the point of interſection is concealed by ſtones and rubbiſh.

The

The pitchſtone here is of various colours, from apple-green to jet-black. Some of it is yelloviſh, or reddiſh.

We ſhall now return, and explore the King's Cove.

This cavern is ſo called, becauſe Robert Bruce found ſhelter and concealment in it when he was proſcribed, and a price ſet upon his head by the Engliſh monarch. It is alſo univerſally reputed to have been the occaſional reſidence of Fioun,* or Fingal, when he reſorted to Arran for the purpoſe of hunting.

The old people here have many ridiculous ſtories about Fioun and his heroes, which have been tranſmitted, from a remote period, by father to ſon, and in their progreſs becoming more and more extravagant. They believe Fioun and his heroes to have been giants of extraordinary ſize.

They ſay that Fioun made a bridge from Kintyre to this place, over which he could paſs, by a few ſteps, from the one land to the other. I could not exactly aſcertain the number of ſteps neceſſary to

* *Fioun* means fair-haired; *Gaël*, his race or nation. All names were originally nicknames, taken from ſome ſtriking peculiarity of the perſon. The Highlanders ſeldom apply the epithet *Gaël* to Fioun, unleſs you expreſs doubts concerning his extraction. But they often characterize him by the ſurname of MachCoul, from the name of his father.

to croſs a ſea of about nine miles. They ſeemed to vary from ſix to twelve. Nor could I learn whether this was a real bridge, or only ſuch ſtepping-ſtones as are uſed here for croſſing waters.

But, what is eſteemed ocular demonſtration of the gigantic ſize of Fioun, and ſufficient to overwhelm the moſt obſtinate ſcepticiſm, the hero is ſaid to have had a ſon born to him in the cave; and a ſtraight groove is ſhewn, cut on the ſide of the cave, which is firmly believed to have been the exact length of the child's foot the day after he was born. The groove is more than two feet in length; and, taking the human foot to be one ſixth of a man's height, it follows, the child muſt have been more than twelve feet high the day after he was born; and, if the parents bore the ſame proportion, Fioun muſt have been from ſeventy to eighty feet high, and his wife could ſcarcely be leſs than from fifty to ſixty; a ſtature ſo enormous, that they could hardly find ſtowage in the cave.

The cave is ſcooped out of fine grained white ſandſtone. A vein of the ſame ſandſtone has ſtood perpendicular in the centre, from which the ſtrata dip rapidly on each ſide, forming the roof into a ſort of Gothic arch, to which the vein above ſerves the purpoſe of a key-ſtone. At the back part of the cave, this vein comes down to the bottom, and forms a perpendicular column, with a receſs on each ſide. The northern receſs is only a few feet

The ſouthern is of uncertain extent, being gradually contracted in breadth, and at laſt nearly cloſed by rounded ſtones.

The length of this receſs, as meaſured by footing, is about thirty feet. From pillar in back ground, to mouth of cave, exceeds a hundred feet. Greateſt breadth may be about forty-nine or fifty feet; and greateſt height the ſame.

The mouth has been defended by a rampart of looſe ſtones; and many ſtones are ſcattered through the cave, which ſeem to have been uſed as ſeats. The bottom muſt have been much lower formerly than now, and probably was below the preſent tide mark. On the floor there is much rubbiſh, apparently the aſhes of fires; and parts of the rock are incruſted with ſmoke. There are alſo innumerable bones of ſheep, goats, and other animals. This ſhows that the animals to which theſe bones belonged, had been conſumed here.

On the column there is a figure cut reſembling a two-handed ſword. Some think this was an exact repreſentation of the ſword of Fioun; others of that of Robert Bruce. But they do not advert, that if Fioun was the giant they ſuppoſe him to have been, this ſword would hardly ſerve him as a tooth-pick.

To me it appears to be neither one nor other, but a repreſentation of the croſs. It ſtands upon a rude outline, repreſenting a mountain, probably Mount

Mount Calvary. On each ſide there is a figure kneeling, and praying towards the croſs. Theſe perſonages ſeem habited like monks, though ſome rude ſcrawls give them a ſort of wings, like angels. It is probable the unpractiſed artiſt meant to combine, in his praying figures, both of theſe characters, in order to impreſs the people with greater veneration for the monks.

The firſt promulgators of Chriſtianity in this country, ſeem to have preferred places already conſecrated, by popular veneration, for public devotion, and inculcating the principles of what was, then, a new religion. During the times of Popery, this cave was very frequently, and is even to this day, occaſionally uſed as a place of worſhip. As the croſs is a conſpicuous implement in the Popiſh religion, it was natural to have it cut at the bottom of the cave, where the prieſt would naturally ſtand, and towards which all eyes would be directed.

The ſides of the cave exhibit innumerable ſmall figures, equally rude, repreſenting dogs chaſing ſtags, and men ſhooting arrows at them. They alſo repreſent goats, ſheep, cattle, and various other animals, though the figures are ſo rude, that it is ſeldom poſſible to aſcertain what they repreſent.

Mr Jamieſon, p. 125, thinks theſe ſcratches were 'made by idle fiſhermen, or ſmugglers.'

But, unfortunately, there are no fiſhermen on this coaſt, nor is there a ſafe landing-place for boats near this place. Fiſhermen would have given us fiſhes, nets, boats and lines, of which no ſhadow of repreſentation appears among the figures. With regard to ſmugglers, they may have occaſionally concealed their goods in this cave; but they are not remarkable for leaving memoranda of their buſineſs behind them.

The people here beliveve theſe figures to be repreſentations of various exploits of Fioun, and his heroes in the chaſe. Thoſe who believe Fioun to have been of ordinary ſtature, may be in the right; and thoſe who believe him to have been a coloſſus, are obliged to draw upon his necromancy, to enable him to furniſh figures ſo far below his own dimenſions.

As theſe figures repreſent only objects connected with the chaſe, they appear to me to have been made at a remote period, when hunting was the ſole employment, and chief ſource of ſubſiſtence.

North of this cave are ſeveral ſmaller caves, which communicate with each other. One of theſe is called the King's kitchen, another his cellar, his larder, &c. On the ſouth ſide there is a cave called the King's ſtable, which contains more area than the royal palace, as the cave of reſidence is here diſtinguiſhed. It is ſcooped out of the ſolid ſandſtone; the roof not very high, but

but higher at the mouth than at bottom. Its oppoſite ſides meet each other at an angle of from 80° to 90°. Of courſe, its mouth is very broad, and muſt have fallen, were it not ſupported by a pillar, exactly in its centre, on which arches reſt from each ſide, diſplaying a ſtriking likeneſs to the ruinous arches of a Gothic cathedral. The floor and roof of this cave reſemble two ſpread fans, not parallel, but widening from their centres.

I felt a holy veneration while exploring the caverns where Bruce had ſheltered; not becauſe he was a king, but becauſe he was a patriot, a hero, and an aſſertor of the independency of his country. Such characters as his ought to be held in everlaſting honour. I figured him at every corner, heaving a deep ſigh over the misfortunes of his country; her people expoſed to lawleſs maſſacre; her property pillaged, or wantonly deſtroyed; her daughters inſulted and violated; her nobles either ſunk in ſelfiſh ſloth, or baſely purchaſing a precarious exiſtence by unlimited ſubmiſſion to her foes. Then his eyes darted fire; he graſped his ſword; and vowed, with the help of God, vengeance, and the redreſs of his country's wrongs! I then figured him ſtalking about, inſenſible of the objects around him, but abſorbed in profound thought, and concocting thoſe plans by which he ultimately ſucceeded, not only in vindicating the

independency of his country, but in raiſing her to an unrivalled pinnacle of glory.

Among all the heroes, robbers, and murderers, which either pollute or embelliſh the page of hiſtory, the characters and actions of Wallace and Bruce are ſuch as the philoſopher muſt approve, and the ſincere Chriſtian cannot condemn. They drew not their ſwords to injure or oppreſs others, but to defend themſelves and their country. Compared with them, your Napoleons, your Charles XIIths, your Timur Becks, your Alexanders, &c. whether they operate with ball and bayonet, by midnight aſſaſſination, ſlow poiſon, ſtarvation, or tortures; as their ſole object is to deſtroy or to enſlave mankind, they ought to hide their diminiſhed heads.

Never did ſuperſtitious devotee feel more veneration for the tooth, or *os coccygis*, of a ſuppoſed ſaint, than I for the rocks which Bruce had honoured by his contact, and which had ſheltered his adverſity. The ground was more than claſſical—it was holy.

Having noted what occurred along the ſea-beach of this diſtrict, we ſhall now return, and examine the hills that bound the vale of Shiſkin and Glenluig on the eaſt.

In page 124, Mr Jamieſon, ſpeaking of the Clachan Glen, ſays, 'As the glen winds up-'wards, the hills become higher, being in all pro-'bability compoſed of *ſcenite*, penetrated with 'veins

'veins of baſalt and porphyry; for we find the 'bed of the burn covered with bowlder ſtones of 'baſalt, porphyry, and *ſcenite.*'

I found ſeveral fragments of ſyenite, not only in the Clachan-Burn, but in various other burns which flow from theſe hills. But I was not able to trace a ſingle ſolid rock of ſyenite in any of theſe hills; and always found the fragments in queſtion had been detached from rocks of breccia, or puddingſtone.

In other places, Mr Jamieſon recommends an examination of the ſtones upon the ſea-ſhore, as an eaſy way of aſcertaining the compoſition of the contiguous rocks and mountains. Judging by this criterion, I muſt have inferred, that a great part of the mountains of Arran, from Whiting Bay round by the ſouth to Loch Ranſa, were compoſed of ſyenite, intermixed with ſparry limeſtone, becauſe the mouth of every rivulet and creek where boats can land, exhibits great quantities of ſyenite, with occaſional mixtures of ſparry limeſtone. But I ſoon found that theſe ſtones had been brought from the oppoſite ſhore of Argyleſhire as ballaſt to boats.

A high conical hill looks down upon the village of Shedog *, whoſe northern baſe is waſhed

* This village is often called *Shiskin*; but the natives appropriate this name to the vale.

by the Clachan Burn. On aſcending the ſouth-weſt baſe of this hill, thick ſtrata of red clay ſchiſtus are viſible, whoſe decompoſition has formed a conſiderable extent of ſoil, of a vivid crimſon colour, but infertile. I conceive this clay might be uſed for making bricks, tiles, jars, &c. of ſurpaſſing beauty. The low ridge, between this hill and the Brown Rocks, projects ſeveral plains from its ſides, parts of which are cultivated, though the cultivation might be very much extended. This ridge is moſtly compoſed of red ſandſtone and ſhiver, interſected by numerous veins of whinſtone.

The hill above Shedog is compoſed of the ſame ſpecies of ſtrata; but it is ſurmounted by blotches of ſhattery whinſtone; on which, where there is any ſoil, all the moſt nutritive graſſes grow with the utmoſt luxuriancy. This whinſtone diſcovered numerous concretions of calcareous ſpar, either diſſeminated through the ſtone, or formed in cracks and cavities; from whoſe decompoſition, perhaps, the nutritive graſſes may be accounted for.

The ſtrata in Clachan Glen are ſimilar to thoſe ſo often deſcribed, viz. red ſandſtone and ſhiver, with numerous beds of white ſandſtone interpoſed. They are only remarkable for their horizontality, and great regularity.

But on reaching the head of the Glen, where the Clachan Burn is confined between ſteep rocks,

new

new and unaccountable phenomena preſent themſelves. Very thick ſtrata, of red clay and ſandy ſhiver, alternating with regular beds of ſandſtone, are croſſed, and divided into compartments by very broad veins, or zones, of ſhattery whinſtone. The pieces of this whinſtone are generally of a pyramidal form, though they are frequently a confuſed ſhattery maſs, without adheſion to each other, and of no determinate figure. They are generally ferruginous on the outſide; but when broken into, ſeem a confuſed mixture of ſandſtone and baſalt. Theſe compartments of whinſtone are immerſed in the ſandſtone ſtrata, having all the appearance of broad veins. But further up, theſe pyramidal veins of baſalt, were not only ſeen immerſed in the ſandſtone ſtrata, but to reſt upon a very thick ſtratum of red clay ſhiver, ſhattery, and of conſiderable hardneſs. The upper ſurface of this ſtratum is very regular; and, like all the other ſtrata here, its inclination is in the ſame direction with, though its angle is ſomewhat greater, than the declivity of the burn. This circumſtance has cauſed its upper part to be expoſed for a conſiderable extent. From its angle of inclination, I doubt not but it forms the baſis of all the other ſhattery veins lower down, which are not cut to a ſufficient depth to expoſe their baſes to view.

Here, then, we have got what has every appearance of whinſtone veins, deſcending to no great

great depth, but intercepted by a regular ſtratum of indurated clay.

Theſe main veins are of various dimenſions, from a few feet to more than a hundred; and they are at very unequal diſtances from each other: nor is their continuation on oppoſite ſides of the burn always in the ſame line.

Beſide theſe main veins, numerous other veins, of various ſpecies of whinſtone, interſect not only the ſandſtone ſtrata, but the main veins themſelves, in almoſt every direction.

The latter veins are commonly ſmall, though they are ſometimes of very large dimenſions; and their courſe is generally ſo irregular, that it can hardly be traced.

One large vein of this ſort attracted my notice, where it interſected a main vein of ſhattery and pyramidal whinſtone. It exhibited a confuſed jumble of ſoft ſteatites, intermixed with rounded and harder maſſes of the ſame ſpecies, variegated with rounded nodules of pitchſtone, baſalt, porphyry, ſandſtone, and various other ſtones. In ſome parts of this vein, the ſubſtramen which kept theſe ſtones together, was ſoft fatiſcent whinſtone, of a dark colour.

After paſſing theſe rocks, I aſcended to the ſummit of the hill, on the ſouth ſide of the Clachan Glen, where a very extenſive rock of limeſtone is expoſed to view. It runs in the form of

of a vein in primary puddingſtone, from north-weſt to ſouth-eaſt. In one part it juts above the ſurface in the form of tumuli, or little hills, the upper parts of which exhibit numerous rounded pebbles, conſiſting of quartz, jaſpers, flints, &c. &c. cemented in a ground of indurated chalk. This limeſtone has been quarried in ſeveral places, and is ſeen to be compoſed chiefly of indurated chalk, of a white colour, intermixed with pieces of a bluiſh colour, or with granulated ſpar. One circumſtance is remarkable, that the deeper it is penetrated, the ſilicious pebbles which encumber the ſurface, become ſmaller in ſize, and much leſs frequent than in the upper parts. It ſeems hence to follow, that if the rock were wrought to a ſufficient depth, none of theſe ſilicious ſtones would be found in it; and it might yield lime approaching to abſolute purity.

Beyond where the vein breaks out into hills, it is ſeen to run a long way towards ſouth-eaſt. Here no ſilicious ſtones are ſeen intermixed in it; but it conſiſts of rounded pieces of white chalk, immerſed and cemented in greyiſh chalk, or in granulated ſpar of lime.

The ſummit of theſe hills is primary puddingſtone, from which the ſtrata ſlope in all directions.

A road has been made from the Vale of Shiſkin, up to this limeſtone, which is exceſſively ſteep in many places. A very eaſy deſcent might be found by

by the ſouth ſide of the hill above Shedog; and the lime would not travel far in this direction, until it reached improveable vallies, emboſomed among the hills. This road might alſo throw off a branch to Sliddery, and open a communication between the limeſtone and South-End.

Above a very ſteep mountain torrent, I obſerved a large body of limeſtone, of a yellowiſh white colour. Its poſition being concealed by rubbiſh, I could not aſcertain whether it was a vein, or ſtratum, though it is probably a ramification from the main vein deſcribed.

Returned by the channel of this torrent to the bottom of Clachan Glen. The rocks, through a conſiderable depth, were ſhattery whinſtone, very irregular, and conſiſting of looſe pieces, being probably a face of ſome ſuch veins as occurred lower down. Below the whinſtone, granitic porphyry occurred, arranged in ſtrata of various, but ſometimes of conſiderable thickneſs; and the ſtrata always affecting a ſubdiviſion into quadrangular blocks, or columns. In other places, the porphyry was very confuſed, and exhibited no regular ſtratification. In all caſes, the ſmoky quartz and fellſpars it contained, ſeemed very much rounded; and many of the latter were much decompoſed.

The burn being here encumbered with bowlder ſtones, did not ſee on what the porphyry reſted; but lower down, the ſame rock is ſeen to reſt on red

red ſtrata of ſoft argillaceous ſandſtone, which inclines nearly as the water deſcends. Where the porphyry terminates, ſtrata of arenaceous baſalt, are ſeen to reſt on a ſimilar baſis; only the ſandſtone next the baſalt is white.

The Clachan Glen deſcends nearly from eaſt to weſt, and a track, or footpath, conducts along its northern ſide, acroſs the iſland, to Lamlaſh. In the upper part of the Glen, the ſtrata are moſtly red ſandſtone, interſected by whinſtone veins. The ſummit of the iſland is an extenſive plain, moſtly occupied by peat bog; through which hills, or tumili, of primary puddingſtone, are ſcattered.

Where the peat moſs is cut to the bottom by torrents, numerous fragments of trees are ſeen intermixed, though none of great ſize. This ſhows that wood had formerly grown in this expoſed ſituation, at an elevation of from ſeven to eight hundred feet above the level of the ſea.

Ardbhein riſes above the northern ſummit of the Clachan Glen. It is rounded in every direction, and moſtly covered with ſoil; and ſeems to be the higheſt hill ſouth of the granite mountains. Its ſtrata, where viſible, are ſandſtone and whinſtone.

The rugged channel of Balmichel Burn, ſeparates a detached hill, or rock, from the body of the land, on the ſide of Shiſkin. This hill is compoſed of various ranges of baſalt above, moſtly arenaceous,

arenaceous, with a confuſed maſs of ſandſtone below. Great part of this ſandſtone is mouldering into ſand and earth; and the maſs looks like a ſteep bed of ſand. But it has ſtratulæ, and detached pieces of ſandſtone, of greater hardneſs; and the whole ſeems a ſtrange intermixture of ſoft and fatiſcent, with hard and ſilicious, ſandſtone. The colours are browniſh white, yellowiſh white, greyiſh white.

Further on, towards the head of the Shiſkin Vale, and mouth of Glenluig, the primary puddingſtone begins to form the boundary of the vale; and the projections of ſandſtone ſtrata between it and the vale, become leſs extenſive.

The farm of Darineach is ſituated upon a promontory, where the Vale of Shiſkin terminates, and that of Glenluig commences; and is the laſt conſiderable projection of the ſandſtone ſtrata, from the puddingſtone and other rocks. This farm forms a ſort of bay, emboſomed among the puddingſtone rocks, which jut out towards the plain on each ſide of it. The ſtrata of the bay (if bay it can be called, which riſes rapidly from the cultivated part below) are moſtly red ſandſtone, interſected by numerous whinſtone veins. Alternating with the ſandſtone, here are ſeveral ſtrata of ſoft bluiſh clay, diſcovering numerous micaceous particles; without addition, not apparently capable of being rendered adheſive; and evidently

evidently formed from the decompoſition of micaceous ſchiſtus, or rather, perhaps of ſlate.

Aſcending to the ſummit, found this bay of ſtrata bounded by two walls of primary puddingſtone, one projecting towards the ſouth-weſt, another towards north north-eaſt. No whinſtone veins were obſerved to penetrate the puddingſtone: only, on the ſouth-weſt boundary, a perpendicular vein of puddingſtone, having its ſtones ſmaller and more rounded, was ſeen to penetrate the rock from top to bottom, though wideſt at top.

At the point where theſe two walls joined, a vein of calcareous puddingſtone appeared, which ſeems to be of great magnitude; though, unleſs the earth were ſtripped off, it is impoſſible to condeſcend upon its extent.

The part expoſed to view conſiſts of rounded nodules of chalk, of a white colour, immerſed in a cement, or ground, of the ſame, though of a greyiſh colour. Towards the northern ſide, where it begins to be covered with earth, angular pieces of bluiſh limeſtone, or of granular ſpar, are cemented by means of ſepta of bright ſparkling calcareous ſpar. Here the vein diſcovers very ſtrong indications of copper; but, while labouring to explore its contents, ſuch a denſe fog commenced, that we were glad to deſiſt, and with the greateſt difficulty reached the plain without breaking our necks.

Nature

Nature has furniſhed a very eaſy aſcent for a road to this limeſtone; and, ſhould it ever come to be worked, there is a probability of finding a vein of copper connected with it.

Advancing to the head of Glenluig (*Glen of Calves*), the puddingſtone rocks form bold projections, or rather rounded mountains, on the ſouth ſide of the Glen, while few inſtances occur of ſandſtone ſtrata projected from their baſe. On the north ſide, the caſe is very different. The ſandſtone ſtrata form a gentle acclivity, exhibiting much improveable land with a ſouthern expoſure. Theſe ſtrata are cut off by the puddingſtone rocks; theſe again by the ſchiſtic mountains; and the laſt by the ſtill higher ridge of granite which looks down upon Glen Roſa, and faces Goatfell.

At the head of Glenluig three ſtreams unite, and form the river Machry. One deſcends from the granite mountains, which bound Glen Roſa on the north-eaſt. Another from the head of the Glen, by which the road paſſes to Broddick Bay; which is a continuation of Glenluig, on the eaſt. The third deſcends from the puddingſtone mountains on the ſouth ſouth-eaſt.

Theſe puddingſtone mountains diſcover no ſymptom of regular ſtratification. They exhibit numerous cracks, and ſometimes vacancies, which ſeem to have been produced by their ſhrinking during conſolidation; but bear no reſemblance to the

the conſolidation of one ſtratum above another. Theſe cracks form the rocks into irregular maſſes of vaſt ſize.

No whinſtone veins were ſeen to penetrate theſe rocks; but in the rugged glen which deſcends from the ſouth ſouth-eaſt mountains, they were ſeen to be interſected, from top to bottom, by ſeveral large veins of indurated clay, of a bluiſh colour, diſcovering numerous micaceous particles, and decompoſed fragments of ſlate. This clay appears to have been derived from the decompoſition of micaceous ſchiſtus; and to have been waſhed into gaps, formed by the conſolidation, and conſequent ſhrinking, of the pudding-ſtone rocks.

Another remark deſerves attention, that the ſtones in theſe rocks are generally of ſmall ſize; and in that caſe are very much rounded. When of larger ſize, they are generally angular, or rounded only at the thickeſt end.

Great varieties were obſerved both in the colour and hardneſs of the ſubſtramen. In ſome caſes, it appeared to be concreted granitic or baſaltic ſand, or micaceous ſchiſtus, or all the three irregularly blended. In other caſes, particularly on the road towards Broddick Bay, the ſubſtramen is either concreted baſaltic ſand, or ſoft baſaltic matter; and the concretions are generally angular pieces of hard baſalt, of a blue colour.

On the ſummit of the rock, which riſes bold and majeſtic above the farm-houſes of Glenluig, towards the ſouth, a very large vein of limeſtone is ſeen to deſcend through the puddingſtone. Only a ſmall part, on its weſtern ſide, is uncovered at its ſummit; but, from the cheeks of puddingſtone on each ſide, and the broad zone of ſweet herbage which deſcends almoſt to the bottom of the mountain, its great breadth is clearly aſcertained. Were the thin, and almoſt perpendicular covering of earth removed, I doubt not but it would be found near the bottom of the mountain, where it is covered by looſe fragments of rock. As this vein is perpendicular, and the rocks on each ſide of it very hard puddingſtone, it may be wrought without any danger of the roof falling in.

Having made theſe general remarks, we beg leave to return, and deſcribe the quality of the vein, as far as it is expoſed to view.

On the weſtern ſide, it conſiſted of rounded blocks of white indurated chalk, immerſed in a cement of the ſame, though of a greeniſh colour, owing to an impregnation of copper. This part appeared to be pure calcareous puddingſtone, without any mixture of ſilicious ſtones. Towards the eaſt, it exhibited a congeries of irregular pieces of limeſtone, of a dull white externally, but, being fractured, diſcovered granulated, and ſparkling ſpar of lime, in a bluiſh ſubſtramen. Theſe pieces were

were either looſe, or cemented in irregular veins of ſpar. Some of theſe veins were of a green colour, and diſcovered prominent indications of copper. The latter ſymptoms prevailed moſt where the vein began to be covered with earth.

It would be eaſy to lay open this vein, which exhibits a very flattering proſpect of including a vein of copper towards its eaſtern ſide. If this ſhould fail, the expenſe would be amply repaid by the excellent limeſtone it would furniſh; and that, too, obtained at a mere trifle of expenſe.

In Glenluig, I obſerved two banks of reddiſh clay marl, which, though not of the beſt quality, would prove highly advantageous to the ſandy and gravelly ſoils, and improveable moſſes, in that diſtrict.

We ſhall now return to the Vale of Machry.

This Vale ſtretches along the head of a bay of the ſame name, and generally exhibits an open ſea-beach. The land is wet in many places; and, in others, is too much encumbered with ſtones for tillage; but would anſwer well for ſeveral ſpecies of trees. The river Machry has cut a deep channel through red ſandſtone in ſeveral places; and its mouth, though very incommodious, is uſed as a harbour for boats. A ſmall lake is ſituated within the land north from the river, whoſe outlet is choked with ſtones thrown up from the ſea. In order to clear the paſſage, and convert the lake in-

to a harbour, a canal was dug to the river, and a barricade thrown acroſs its channel, in order to turn the water of the river through the lake. But the barricade being thrown at right angles with the current of the river, the firſt flood ſwept it away.

As it would be important to have a harbour here, there being no place along this coaſt where a veſſel can find ſhelter, from Loch Ranſa to Lamlaſh, and this nearly equidiſtant from both; an angular ſandſtone rock ſhould be cut down, and the barricade thrown at an acute angle with the ſtream, ſo as to conduct it gradually into the canal.

FROM MACHRY TO GLEN IORSA. *

The land riſes gradually towards the mountains on the north-eaſt of Machry, and exhibits many extenſive tracts which might be reduced to cultivation. The ſtrata are moſtly red ſandſtone, interſected by numerous whinſtone veins. The ſtrata aſſume a higher angle, and the ground riſes more rapidly, as they approach the mountains, from which they ſlope, chiefly towards the ſouth.

On ſeveral parts of Machry Moor, and near Auchingallan farm-houſes, many large fragments of pitchſtone, of a dark green colour, are viſible, though the ſolid rock is concealed.

Upon a bank which faces the ſea, below the ſame farm-houſes, there is a circle of large ſtones, faſtened in the ground, and including a cairn of looſe ſtones. Whether this has been a Druidical temple, or for what purpoſe it was conſtructed, I ſhall not pretend to decide; but it is reputed here to be the grave of heroes.

The firſt ſecondary mountains we approach in this direction, are irregular blotches of primary

* Pronounced *eerſa*.

puddingſtone, which forms bare rounded cliffs upon their ſummits. Of theſe, Vannerloch-hill is the higheſt; and it conſiſts of quartz, granite, ſchiſtic rock, baſalt, and other ſtones of various ſize, apparently cemented in a ſchiſtic ground. Many of the ſtones are angular; and ſome, eſpecially the quartz, are of large ſize.

I proceeded to the top of Bheininhuruch (*Hill of Sheep*). On the ſouth ſide, this hill is compoſed of granitic porphyry, whoſe fellſpars are generally large, and conſiderably rounded. On the north ſide, it is compoſed of micaceous ſchiſtus.

From the top of this hill, the deep chaſm of Iorſa Glen is ſeen nearly to its ſummit. The river Iorſa commences behind Keim-na-caillich; and, receiving many tributary ſtreams, it follows a ſouth-weſt courſe, through the deep chaſm it has ſcooped out, to the ſea. It is bounded by the ſchiſtic mountains on the lower part, which are long, round-backed, and covered with heath. The granite mountains form its boundary on the upper part, which are rounded towards the glen, but abrupt and ragged towards their ſummits. They are almoſt all bare rock, with hardly any intermixture of herbage. In theſe ſilent receſſes, ſterility and deſolation exerciſe an undiſputed ſway. A hollow in the granite mountains conducts to Glen Roſa, as formerly noticed. The bottom of this

this glen is encumbered with bowlder ſtones of granite, or is filled with granitic ſand. The river forms a lake near its centre; and a ſmaller lake, or pool, lower down, among the ſchiſtic mountains, where conſiderable quantities of ſalmon are ſometimes caught.

In tracing Iorſa Glen downwards, after paſſing the ſchiſtic mountains, the firſt viſible rock was puddingſtone, interſected in one place by a vein of whinſtone, in others by veins of red ſandſtone. Next, vertical ſtrata of ſandſtone occurred, alternating with puddingſtone. Beyond theſe, ſandſtone; whoſe ſtrata become more horizontal as they recede from the mountains.

In the mouth of Glen Iorſa, there is a conſiderable valley, and ſome cultivation. On the ſide of the river, this valley exhibits a ſteep bank, compoſed of granitic ſand, intermixed with ſchiſtic clay. In many places, it is ſo far conſolidated, as very much to reſemble ſandſtone. On its top, there is a deep and extenſive moſs; which ſhows that it does not admit water to percolate.

In the mouth of the valley, overlooking the ſea, there is a very large obeliſk, which may be the remains of a Druidical temple.

The cultivated ſoil, towards the ſouth of this valley, has been waſhed down from the ſtrata of red ſandſtone and ſhiver; which, with primary puddingſtone, form its ſouthern boundary. It is

not unfertile, and may perhaps cover the granitic and ſchiſtic depoſite, which occupies the north ſide of the vale; which is extremely unfertile, unleſs we regard the moſs accumulated upon its ſurface, as capable of being fertilized.

FROM

FROM THE RIVER IORSA TO LOCH RANSA.

This extenſive tract is chiefly occupied by ſchiſtic mountains, above which the granite forms a long rounded ridge of bare rock, which is broken into rounded detached mountains towards the north. Towards the ſea, the ſchiſtic rock generally preſents an elevated bank, or terrace, on which the cultivated land is ſituated. The ſoil is moſtly a bluiſh micaceous clay, formed from the decompoſition of the ſchiſtus; and, where of ſufficient depth, is not unfertile. Often the ſolid rock juts up through the ſoil; and conſiderable tracts are encumbered by large ſtones. Many tracts, of conſiderable depth of ſoil, are wet; and much waſte land, among theſe mountains, might be improved either for corn, or herbage.

Paſſing the river Iorſa, ſtrata of red ſandſtone, alternating with puddingſtone, are continued along the ſea-bank; and in them are formed ſeveral romantic caves, though not of great ſize. As we approach the ſchiſtic rocks, the ſandſtone ſtrata aſſume a higher angle of elevation. They at laſt become perpendicular, their hardneſs being much increaſed; and their character is changed

changed from common ſandſtone to rubble ſtone, the *Scyrus* of Dr Walker. Advancing further, their red colour is gradually changed into a grey; and that again paſſes into a bluiſh colour, with numerous micaceous particles. The ſtrata now become very irregular; and a conſiderable tract intervenes, where it is difficult to ſay whether the rocks be ſandſtone or ſchiſtus. In fact, the ſandſtone appears evidently to graduate into the ſchiſtus.

At laſt, the rocks become decidedly ſchiſtic; and they have no more ſandſtone ſtrata interpoſed betwixt them and the ſea.

The ſchiſtic ſtrata are vertical; often bent and irregular. During the decompoſition of this ſtone, it has a tendency to ſubdivide into thin laminæ, or plates; which has occaſioned this name to be applied to it. The ſurfaces of the plates are of a grey, or bluiſh grey, or leaden colour; and exhibit numerous ſcales of mica, hence called *Lepidotes*, or ſcaleſtone, by Dr Walker, and *micaceous ſchistus* by others. Theſe plates are never regular, like thoſe of ſlate; but are curved, angular, or ramified, in various whimſical directions. Numerous veins, and rounded maſſes of quartz, are immerſed in theſe ſtrata, which are frequently of a red, but not ſeldom of a ſparkling white colour, and ſubdiaphanous. Sometimes the main body of the ſtratum is quartz, having only a thin covering of the

the ſchiſtus on its oppoſite ſides. When rounded blocks of quartz are immerſed in the ſtrata, the laminæ are commonly ſeen bent and contorted around them in a curious and whimſical manner.

The ſchiſtic mountains here, like the ſandſtone ſtrata in other places, are interſected by numerous whinſtone veins. Theſe veins are commonly of a darker blue colour; nor do they exhibit the arenaceous appearance of many we have deſcribed interſecting the ſandſtone. On the ſea-bank, and ſome of the upper parts, the veins are often ſcooped out, and form deep and irregular channels for burns. Below the village of Immachar, a vein has been ſcooped out by the ſea, leaving a ſmall creek in the ſchiſtic rocks, which is uſed as a very incommodious harbour for the ferry-boat to Sadel in Kintyre. This is the neareſt point of Arran to the mainland of Scotland, the channel being only reckoned from four to five miles acroſs.

The cheeks of the whinſtone veins are commonly harder, and of a darker blue colour, than the other parts of the ſchiſtic rock. Indeed, except in ſome ſymptoms of a lamellar ſtructure, it is difficult to diſtinguiſh the cheeks from the whinſtone. But I did not obſerve any inſtance of a ſeparate and detached vein, on each ſide of the whinſtone vein, as commonly happens where theſe veins interſect ſandſtone.

This

This is the genus of rock in which ſlate and *ardeſia* are commonly found. I ſaw many veins of ſlate in theſe rocks, which generally appeared too thin to expect much good from them. But in croſſing the farm of Whitefarlan, the property of Captain Fullarton Eſq. no ſea-bank appeared; and extenſive fields were projected into the ſea, of which the ſoil conſiſted entirely of broken fragments of dark blue ſlate. What ſurpriſed me moſt of all was, that theſe fields ſeemed endowed with uncommon fertility, and carried crops of corn and potatoes, equal, if not ſuperior, to any I had ſeen in Arran.

Here the natural woods exhibited a moſt picturesque appearance, being ſkilfully managed and preſerved, which is not the caſe in other parts of Arran. From obvious appearances, I doubt not but a great part of this farm reſts on an immenſe vein of ſlate. In all caſes where ſlate occurs, there is much more bad ſlate than good. But among the bad, there is always a main vein, which is good; and I doubt not but ſuch a vein may be found here. If found, it may be wrought up from tide-mark, ſo as to form a harbour, ſafe for veſſels which enter with a view to tranſport the ſlate.

Behind Tundergay there are two conſiderable hills of white quartz, or ſilicious ſpar. This is the

the *petunse* of the Chineſe ; and being mixed with white clay, forms their porcelain ware.

At a place where there is an opening through the long ridge of mountains, aſcended Beinbharing. The lower part of the mountain is compoſed of micaceous ſchiſtus, generally covered by mooriſh ſoil, and formed into a ſort of terraces, which riſe above each other in ſucceſſion. On reaching the granite, the aſcent becomes ſuddenly more ſteep. Hardly any ſoil appears; and the eye is fated with the dreary proſpect of bare rock. Between the two high granitic mountains, Beinbharin and Muilnadaimh, there is an immenſe corry, or hollow, in the bottom of which is a beautiful oval lake, of great depth, called Corry-in-lochan. The people here believe that a water-bull, of great ferocity, reſides in this lake, and that he often comes out, and uſes freedom with their cows.

Saw that Beinbharin has two vaſt veins, or bones, of granite, conſiſting of huge blocks, arranged like a regular wall, and meeting at right angles. One of theſe is projected towards the north, the other towards the weſt ; and the ſtrata reſpect them, as tiles do the roof of a houſe. On the eaſt and weſt ſides, the mountain is rounded, and reſembles a long barn with a rounded roof. But on the north, the ſpace between theſe two rectangular veins is ſcooped out, leaving perpendicular

dicular precipices overhanging the Corry *, awful and tremendous.

On the ſhoulder which connects Beinbharin with Muilnadaimh, a vein of granitic porphyry is ſeen running through the granite. It conſiſts of rounded fellſpars and ſmoky quartz, inſerted in an arenaceous ground, of a bluiſh grey colour. Here, alſo, ſeveral fragments of whinſtone are ſeen; but no vein of it could be found.

Advanced along a ſort of terrace on the eaſt ſide of Beinbharin. The lower part of the mountain here is granite, of ſmall grain, reſembling ſilicious ſandſtone, and moſtly of a ſilvery grey colour in its freſh fracture. Above this the large-grained granite riſes bold and abrupt; and it often exhibits a ferruginous tinge.

In one place, the ſmall-grained granite is rapidly decompoſing, and it is furrowed into broad excavations by water. In one of theſe excavations, found a vein of dark blue whinſtone, containing a mixture of pitchſtone, running parallel to a vein of granitic porphyry, arranged in priſmatic maſſes. This porphyry is of a bluiſh grey colour. It contains a few cryſtals of fellſpar, and theſe always rounded; but rounded ſmoky quartz are frequent.

Advanced

* *Corry*, in Gaëlic, means a hollow in the boſom of mountains.

Advanced to Loch Tanadh (*shallow lake*), which may be about a mile and a half long, and averaging a quarter of a mile broad. The plain in which it is ſituated is encumbered by rounded blocks of granite, and exhibits ſtunted heath growing upon a ſoil moſtly compoſed of granitic ſand. The granite mountains in all directions around this plain, are rounded, and exhibit the chilling and ſteril proſpect of naked rocks, only relieved by a few tufts of heath, which increaſe their gloom. This lake diſcharges its waters by the Shirel burn into the river Iorſa.

Paſſed down Glen-Catacol, which deſcends north-eaſtward from this lake. For a conſiderable way the granite is ſmall-grained, on each ſide of the glen, ſuch as was formerly deſcribed. It conſiſts of ſmall angular maſſes; ſometimes of priſms of three or four ſides, of conſiderable length. Theſe fragments are ſhattery and confuſed, and they diſcover no regularity, or approach towards ſtratification. Lower down, large-grained granite occurs; and it is ſeen arranged in tabular ſtrata of various thickneſs, in the bottom of the burn, generally with great regularity. Its inclination is nearly the ſame with the deſcent of the waters. In ſeveral places, it is interſected by large horizontal blocks, to which I have given the name of *granitic veins*. Some whinſtone veins were ſeen to interſect the ſmall-grained granite; and fragments of

of whinſtone and porphyry were ſcattered along the baſe, which muſt have come from veins towards the ſummit of the mountain.

This rugged glen expands into a beautiful valley, called Catacol, about three miles in length, and one mile at its broadeſt part. About a mile and a half from the ſea, the granitic mountains are intercepted by the ſchiſtic, on each ſide of the valley. Their junction is viſible on the ſouth ſide of the valley, and it ſeems to be a perpendicular crack; though exceſſive rain, and approaching darkneſs, prevented its examination.

The ſoil of this valley is chiefly alluvial, from the ſchiſtic rocks; and conſiſts of a bluiſh grey clay, of conſiderable fertility. Where it has been waſhed from the granite, the ſoil is very unfertile, and chiefly conſiſts of granitic ſand, encumbered with rounded blocks of the ſame.

Upon the ſea-beach, at the bottom of this valley, a ſmall green tumulus is ſhown, called Arin, which ſome people think occaſioned the name of the iſland. The traditions of the people concerning this Arin are, that he was a Norwegian freebooter, whom Fioun fought and ſlew here, and that he was buried below this tumulus. This may be all true; but it does not appear probable that his name would be affixed to the iſland which he had unſucceſsfully invaded. Others ſay, that Arin means

means *Hill of Slaughter*, being the ſpot where Fioun killed a man in ſingle combat.

The rocks, onward to Loch Ranſa, are all ſchiſtic; in ſome caſes, ſtratified with conſiderable regularity.

N GLEN

GLEN RANSA.

Loch Ransa extends about a mile within land, beyond which the glen extends ſouth-weſtward about two miles, to the baſe of Tornidneon; its breadth varying from about half a mile to nearly a mile.

In the loch, veſſels find ſafe anchorage when the wind is off the land. Near its head, a green peninſula interſects the loch on its northern ſide, forming within it a commodious baſon, of great depth of water. The ſhifting of the river Ranſa has thrown a bar in the mouth of this harbour; and it would be deſireable to have the river thrown back into its ancient channel, in order to blow out this bar.

On the point of the peninſula are the ruins of Loch Ranſa caſtle, of ſome magnificence. It is ſaid to have been built by one of our Scottiſh Kings, and occupied by them when they came to hunt in Arran. Fordun mentions it as a royal caſtle in 1380. It was latterly the occaſional reſidence of the Skermorly family, anceſtors of Lord Eglintoun, while they poſſeſſed the northern parts of Arran.

The

The ſoil of Glen Ranſa is moſtly ſand and chingle, not fertile. It is ſurrounded by high mountains; the ſides, and lower parts of which, are ſkirted by natural woods, and even cultivated to a certain extent; the primary ſoil upon them being better than the alluvial ſoil of the glen. The mountain called Tornidneon riſes bold and majeſtic from the head of the glen; and the naked cliffs of Ceim-na-cailich frown in the back ground.

At the northern entrance of Loch Ranſa, a large vein of dark blue ſlate is ſeen to interſect the ſchiſtic rocks, nearly from north to ſouth, and to run into the loch. This would be very convenient for exportation; but I was told it contains ſo many cracks, called by the workmen *cutters*, that it could not be worked with profit.

Mr Jamieſon, p. 105, ſays, 'Primitive lime-'ſtone occurs upon one ſide of the loch, but I 'had not an opportunity of examining its ſitua-'tion.'

I wiſh he had ſtated the place where it occurred; for, after the moſt diligent ſearch, I only found a few fragments of it on the beach, at that part of the harbour where boats uſually land, and where they are drawn up. They had been evidently brought as ballaſt. Contiguous to this place, and near the ſmithy, a very large, but irregular vein of white quartz, is ſeen to interſect the

ſchiſtic rocks. In ſome parts, it diſcovers a ſlight tinge of iron.

At the head of the glen, the Ranſa has cut a deep and narrow paſſage through the ſchiſtic rocks on the northern baſis of Tornidneon (*Heap of Birds Neſts*); and is joined by a ſtream, which, burſting through a narrow paſſage, forms a glen on his eaſtern ſide.

Advancing along the very ſteep bank projected from the ſide of Tornidneon, far below which the Ranſa was foaming in his narrow chaſm, we enter an elevated glen called Iſnabirach (*Glen of Queys*). On the ſide of Tornidneon, near the mouth of this glen, the granite is ſeen to meet the ſchiſtus. The line which ſeparates them is nearly perpendicular. But an angular projection of the ſchiſtus is ſeen to cover the granite for a ſhort way, at the ſummit; and a ſmaller angle of ſchiſtus is projected into the granite lower down. Detached fragments of the granite are alſo found in the ſchiſtus, while angular fragments of the latter are found in the granite.

The ſchiſtus, near the line of junction, is of a dark blue colour, much reſembling ſome ſpecies of baſalt in fracture and hardneſs, and is curiouſly twiſted and veined.

The aſcent of Ceim-na-cailich is eaſy in this direction, the back of the mountain being rounded and bare. But on reaching the ſummit of the north-eaſt ſhoulder, our progreſs was ſuddenly arreſted

reſted by a perpendicular precipice of more than a thouſand feet in depth. The awful corry, or cavern below, contraſted with the ragged mountains that encircled it, freezed the ſoul with horror, and, for a time, ſuſpended its active powers.

Two maſſy pinnacles are remarkable on the higheſt ſummit of the mountain. The popular tradition here, is, that a witch beſtrode the ſpace between theſe pinnacles, and let looſe ſuch a deluge as waſhed out the vaſt hollow below. Hence the mountain derived its name; * and it would ſeem her ladyſhip was a Neptuniſt.

Moſt of theſe turreted pinnacles conſiſt of vaſt quadrangular maſſes of granite, placed upon each other like regular buildings, and forming ſtrata with a ſlight inclination to the horizon. One is compoſed of vaſt boards, placed almoſt on edge. Another conſiſts of vaſt quadrangular columns, not unlike thoſe of baſalt. Theſe pinnacles are a ſort of veins interſecting the mountain, which the intermediate ſtrata reſpect, as tiles do the roof of a houſe.

The granite is moſtly large-grained, contains a portion of iron, and is very ſimilar to that of Goatfell. It decompoſes more rapidly in the interſtices than in the veins. Hence the veins are

* Ceim-na-cailich, *the Carlin's Step*. It is pronounced Keim-na-cailich, C in Gaëlic having always the ſound of K in Engliſh.

left ſtanding high above the ſurface; and occaſion the wild, ragged appearance which this mountain exhibits when viewed from the eaſt.

The ſides of the mountain and ſummit are interſected by numerous and often broad veins of porphyry, as is viſible from the zones of fragments ſcattered on the ſurface. Some of theſe veins alſo contain pitchſtone, and pitchſtone porphyry, likewiſe viſible from numerous fragments, though I ſaw none *in ſitu*. Below the brow at the ſummit, ſaw two veins of blue whinſtone *in ſitu*.

The higheſt pinnacle of this mountain looks towards Goatfell, whoſe ſerrated profile, with the high, pyramidal, and ſharp pointed mountains which encloſe the Garbh-Chorie (*Rough Hollow*), contraſted with the horrid chaſm itſelf, immediately below our feet, exhibited ſuch a picture of wildneſs and deſolation, and danger, as excited at once amazement and terror. This chaſm is even more awfully grand than that aſcribed to the witch's water-works; and the ſhadow of Goatfell thrown acroſs it, added much to its gloom.

This mountain is reckoned of the ſame height as Goatfell. From it we looked over Kintyre upon the weſtern ocean, with Jura, Iſla, and many other iſles ſcattered through it;—over Cowal, and the remote mountains of Argyle and Inverneſs-ſhires;—over Bute, the Cumbraes, and Benlomond in the back ground;—over the ſhires of Renfrew

Renfrew and Ayr, and the mountains of Galloway; the rock of Iſla, towards the ſouth, like a vaſt balloon hovering over the ſea. The coaſt of Ireland was ſtretched along, and cloſed the ſcene between the point of Kintyre and Loch Ryan.

The higheſt pinnacle which overlooks Garbh-Chorie, and which forms an immenſe and rude quadrangular tower, from which it requires a very ſtrong head to look down, is compoſed of very broad tabular beds of granite, of various, but generally of great thickneſs, approaching to the form of ſquares, and placed upon each other in a horizontal poſition.

Perhaps I may have been wrong in ſuppoſing that the ſtratification of granite reſpected only veins interſecting the mountains of that rock. This, and the other pinnacles which jut above the ſummit of this mountain (no parallel to which I had ever ſeen before), lead me to think, that beſide the veins which interſect the granite mountains, there are alſo pillars which ſupport the looſer ſtrata, and reſiſt the effects of their decompoſition, or tumbling down. Theſe pillars, like noble and heroic characters in ſociety, ſtill bid defiance to the ſtorm, and continue to ſupport the original grandeur and elevation of their mountain, after the ignoble race, which clung around their ſides, have deſerted and left them. Yet I do not think that

the pillars differ materially from the veins I have ſo often deſcribed. They may be conſidered as veins which ſoon terminate, or whoſe continuation has been undermined, and fallen down.

Here follow the bearings of all the granite mountains, of note, in Arran, as ſeen from the maſſy tower that overlooks the Garbh-Chorie; but it muſt be remarked, that the remoteſt of them are only about one half granitical, the other ſide being compoſed of ſchiſtus. It muſt alſo be remarked, that Goatfell covered the granitic mountains ſouth by eaſt of Glen Roſa. We have alſo added their names in Engliſh, as far as could be collected.

Goatfell (Hill of Goats) ſouth by eaſt.
Caſtle Abhal (Ptarmigans Caſtle) ſouth.
Binnuiſh, ſouth by weſt.
Sail Hamdel (Twiſted Heel) ſouth by weſt.
Binlarſin, ſouth-weſt.
Binbharin, weſt.
Binbhree (Flecked Mountain) weſt by north.
Muil-na-daimh (Humbled Stot) north by weſt.
Tornidneon (Heap of Birds Neſts) north by eaſt.

Copious ſprings burſt from the hollows on the eaſt ſide of the mountain, and form the ſources of the North Sannox water. In a hollow on the northern ſide, there is a ſmall lake, fed by a powerful ſpring which boils up in its centre. This lake diſcharges

diſcharges itſelf indifferently, either towards the ſouth-weſt by the Iorſa, or towards the north-eaſt by the Ranſa; and thus it forms the ſource of two rivers which run in oppoſite directions. Several very copious ſprings alſo burſt from the northern ſide of the mountain, and contribute their waters to the Ranſa. As theſe ſprings are perennial, there muſt be large hollows in the body of the mountain where the water is collected, and ſmall apertures by which it is diſcharged. Perhaps great collections of water of this ſort, riſing higher than the lateral barriers could withſtand, had ſwept them away, and produced thoſe frightful corrys, or excavations, which abound in theſe mountains. This opinion derives additional probability from the circumſtance, that the corrys are moſt frequent on the eaſtern ſide of the mountains, where there is only a very thin and low barrier of ſchiſtic rock, to envelop and ſupport the granite. In all other places, the granite is propped by a broad barrier of ſchiſtic rock, in moſt places riſing high upon its ſides; and there we find no corrys, except the one deſcribed above Tundergay, in the ſide of Beinbharin, where the mountain towers high above the ſchiſtic rock. The gradual action of ſtreams of water ſeems to have ſcooped out thoſe deep chaſms and glens which interſect theſe mountains. Theſe are ſometimes rounded on both ſides; but if they be precipitous

on

on one ſide, they are rounded on the oppoſite.

On the northern ſide of Ceim-na-Cailich, numerous veins and blotches of white quartz, of various dimenſions, occur. In theſe we ſee the cryſtallization of the quartz exhibited, in every degree, from the rudeſt approach towards a regular form, to the perfect topaz. Sometimes a pyramidal apex is formed, terminating in ſplintery quartz. Sometimes an elongated cryſtal is preſented, whoſe baſe is ſplintery quartz. At other times an elongated cryſtal, terminating in a pyramid at both ends, of which the external end is always thickeſt. The laſt are perfect topazes, and they are of very various ſize. They generally form a column of five ſides, of which one end is thicker than the other, and terminate in pentagonal pyramids at each end. Many of them are white and tranſparent; ſome are ſmoky; and ſome are yellow, reſembling the topazes of Cairngorum.

It was formerly obſerved, that the granite of Arran did not contain the uſual proportion of talk inveſting its cryſtals. To compenſate for this, there are ſeveral veins of talk on the weſt ſide of this mountain, interſecting the granite. It is of a dull grey colour; breaks acroſs into rhombuſes of about an inch; ſubdivides into thin laminæ, which are flexible and tranſparent; and their tranſparency is much increaſed by heating to redneſs.

The

The rivulet which has formed the glen on the eaſtern baſe of Tornidneon, deſcends from the ſide of Ceim-na-Cailich; and, taking a northern direction at right angles to its former courſe, joins the Ranſa as formerly deſcribed, forming Glen-Halmidel (*Glen of Pigeons*). Another burn deſcends near, and parallel to it; but, ſuddenly taking a ſouthern courſe, falls into North Sannox water. Theſe two burns form a very extenſive tract into a ſort of peninſula, called Benleven (*Flat-topped Mountain*), having the bay and glen of Sannox on the ſouth, and the loch and glen of Ranſa on the north. In the mouth of the Halmidel there is ſome cultivation; ſoil, decayed ſchiſtus. Through it a very precipitous tract, formed in ſome places into a road, paſſes to Sannox. Were nature ſtudied, a very eaſy road might be made in this direction.

On entering this glen from the Ranſa, we find it compoſed, for a great way, of ſlate, moſtly of a greyiſh blue colour. Aſcending the ſummit of the mountain, we find ſeveral ſlate quarries, from which ſlate had formerly been wrought to a conſiderable extent. The main quarry, which yielded the beſt ſlate, was wrought as far down as water would permit. The ſlate is arranged in ſtrata, at an angle of 45°, and, of courſe, rapidly ſinks under moiſture, as its riſe is contrary to the declivity of the mountain. No ſlate is good which is naturally dry,

dry, and expoſed to the viciſſitudes of the weather. Mr Cowie, who managed this quarry, in order to get better ſlate, and in greater quantity, led up a covered drain, which would have commanded the ſlate more than twenty-five feet below the former workings. But when the object was nearly accompliſhed, he was obliged to deſiſt from want of funds.

This ſlate is of a greyiſh blue colour, with ſometimes a ſlight tinge of purple. Towards the dip, it is of a darker blue, which is the beſt. It is the *ſteganium* of Dr Walker *, not *ardesia* †, as ſtated by Mr Jamieſon, p. 113.

From theſe quarries a road has been made down the ſide of the mountain, to convey the ſlate to Loch Ranſa harbour, diſtant about two miles.

The other rocks on this ſide of Benleven, are micaceous ſchiſtus, in which numerous rounded maſſes of quartz, often of large ſize, frequently occur. Around theſe nodules, the laminæ of the ſchiſtus are frequently ſeen contorted in a curious manner. In the bottom of the burn, ſeveral whinſtone veins are ſeen to interſect the ſchiſtus.

The ſummit of this mountain is moſtly a level plain, of great extent, and covered with peat-moſs.

Numerous

* See Note [O.]

† See Note [P.]

Numerous fragments of hæmatites are found imbedded in ſoft clay, within tide, on the ſouth ſide of Loch Ranſa. Theſe muſt have been part of ſtrata which formerly covered the ſchiſtus here, but which have mouldered away. It is probable the ſame ſtrata ſtill continue to occupy the bottom of deep water, though here they have been worn down by the waves, and expoſure to the weather.

FROM

FROM LOCH-RANSA TO GLEN-SANNOX.

THIS is the ſea-beach of Benleven, of which we have attempted to deſcribe the ſide towards the land.

Advancing along this ſhore, the firſt remarkable thing that occurs is at Craig-na-Srone (*Noſe Rock*), where the ſecondary ſtrata are ſeen reſting upon the micaceous ſchiſtus. The firſt ſtratum of this kind is a ſort of chalky limeſtone, which contains rounded pieces of quartz, fragments of ſchiſtus, &c. ſo as to conſtitute a ſpecies of puddingſtone. Many parts of the ſtratum contain few of theſe extraneous bodies, and would make excellent lime. Further on, a ſort of puddingſtone, red ſandſtone, and ſhiver, occupy the coaſt.

Where the limeſtone reſts upon the ſchiſtus, three whinſtone veins interſect the ſchiſtus, and the ſtrata that reſt upon it. Where theſe veins run in the ſchiſtus, the cheeks on each ſide are penetrated by the whinſtone; and fragments of the ſchiſtus are found immerſed in the whinſtone veins. One vein divides into two, like the letter Y; and pieces of ſlate are found immerſed in the whinſtone, at the angle of ſeparation.

The Scriden rocks are ſtrata of breccia, or puddingſtone,

dingſtone, of moſt enormous thickneſs, and leaning upon the ſide of the mountain at an angle of about 45°. About a hundred years ago, immenſe maſſes fell from theſe rocks, and now encumber the beach, rendering it difficult and dangerous to paſs along ſhore. The concuſſion ſhook the earth, and the ſound was heard in Bute and Argyleſhire. On climbing towards the ſummit, found the whole of this enormous maſs of ſtrata, which reaches almoſt to the top of the mountain, had ſhifted from its original poſition; and that its tranſverſe ſections were ſeparated from each other, ſo as frequently to leave ſpacious gaps between. In many caſes too, the upper maſſes ride upon the ends of thoſe below them; which, having no viſible ſupport, excite the moſt lively apprehenſion that the whole is about to fall, and cruſh the beholder to atoms. The Scriden rocks are reckoned the extreme point of Arran, towards north-eaſt.

Red ſandſtone, with ſometimes puddingſtone, continue along the coaſt, and aſcend to the top of the mountain where they meet the ſchiſtus.

Near the Cock, theſe ſtrata are interſected by a great vein of porphyry, the ſouth-eaſt ſide of which conſiſts of rhomboidal, ſharp-angled cryſtals of fellſpar, inſerted in a red ground. On the oppoſite ſide, the ground is moſtly blue baſalt, with ſome ſtreaks and ſpots of red intervening. This vein ſeems to riſe to the top of the mountain; and it

it exhibits a curious ſpecimen of different ſpecies of porphyry combined in the ſame maſs. I do not ſee how the igneous theory can account for it; becauſe, had it been raiſed from the bowels of the earth in fuſion, it ought to have been homogeneous in its ſtructure. The variety and ſeparation of materials, ſhews they had been conveyed into a chaſm in the ſtrata, at different times, and from different ſources; where they conſolidated, by the attraction of coheſion, which operates upon bodies whoſe particles are brought into cloſe union, by extreme pulverization. The earths, too, when minutely pulverized, combine with water, and paſs from it, either in the form of cement to unite the groſſer particles, or in the form of cryſtals. One point is clear, that the fellſpars in this porphyry had not, like thoſe we have ſo often deſcribed, been conveyed to their preſent ſituation in a ſolid ſtate, becauſe their angles are not blunted, or worn. They muſt therefore have conſolidated where they are now found.

The Cock is not a ſolid rock, as I expected, but a huge maſs of ſandſtone that has fallen from the rocks, and ſtands on a narrow baſe upon the beach. It has acquired this name from mariners, to whom it ſerves as a land-mark, and to whom it preſents a very lively repreſentation of a cock crowing, and clapping his wings.

Contiguous

Contiguous to the Cock, are irregular veins of baſalt interſecting red ſandſtone, of a dark blue colour internally; but the ſides next the ſandſtone are of a deep red colour, ſmooth and gloſſy like Roman bricks. The breadth of theſe veins varies from about one to three or four inches. Further on, the ſame ſort of veins occur in red indurated clay ſhiver.

Several maſſy ſtrata of indurated clay occur, of a florid red colour, to which the ſea has conveyed a fine poliſh. From theſe, I am confident, vaſes, urns, jars, and all the more durable ſpecies of earthen ware, might be fabricated, ſuſceptible of a jaſpidean poliſh; and, being variegated with ſpots of different colours, might emulate the moſt elegant porphyry.

Within tide, are ſeveral ſtrata that look like a Moſaic pavement of finely poliſhed brick, of a florid red colour. They conſiſt of equilateral pieces, or rhombi, of indurated clay, divided by ſeptaria which run in ſtraight lines parallel to each other, and are croſſed by other ſtraight and parallel lines with the greateſt regularity, ſo that each rhombus is encloſed within ſeptaria, which ſeparate its ſides from thoſe of other rhombi, which are parallel to them. The breadth of the rhombi may be about fourteen inches; that of the ſeptaria about half an inch. The colour of the ſeptaria is a pale red, inclining to whiteneſs; and it looks very like puz-

zolana cement, in the interſtices between regularly formed ſtones. In many caſes the pavement is worn down; but the cement, which is harder, preſerves a regular equality of height.

I doubt much if the moſt ſkilful maſon, or even a mathematician, could produce any thing more regular, or more beautiful.

Here are numerous ſtrata of red clay ſhiver, and of red ſlaty ſchiſtus, which include various ſtratulæ of hæmatites, and of kidney ironſtone. The hæmatites is generally arranged in ſtratulæ, but often interſperſed. When ſtratified, it generally comes off in rounded pieces, whoſe ſides are perpendicular, and are thicker towards the centre, than towards the circumference. When interſperſed, the pieces are generally broader, are of a round, or oval form, and flattened towards the circumference.

The pieces that have been long expoſed to the air, are of a blood-red colour, though darker towards the centre. But by a little digging, pieces are found, with a red tegmen, but internally of a fibrous texture, the fibres at right angles to the breadth of the ſtone, and the colour that of ſteel. The interſperſed pieces often exhibit an indented fracture, where the ſurface of the indentations has the luſtre of ſteel.

The kidney-form pieces often exhibit a dull red earthy appearance to their centre. But, where they

they have not been too much expoſed to the atmoſphere, they diſcover a radiated texture, with the luſtre of ſteel.

Theſe two ſpecies feel very heavy; but there are alſo other ſtratulæ, which, though good ironſtone, ſeem to contain a proportion of clay, and do not feel ſo heavy.

The people here call this ironſtone *keel*, and uſe it for marking their ſheep, and various other purpoſes. It has a greaſy feel, and gives a ſtain to the hands, which it is difficult to waſh off.

The farm of Cock is on a ſteep bank projected from the ſide of the mountain. The ſoil is moſtly of a blood-red colour, and is compoſed of the debris of the ſchiſtus, and of the ironſtone which it includes. It is wholly encumbered with this ironſtone. Where burns had made excavations, I traced theſe ironſtone ſtrata to the ſummit of the mountain.

What is moſt extraordinary, great quantities of this ironſtone are found, imbedded in clay, below peat bogs, on the flat ſummit of the mountain. This clearly ſhows that the ſummit was formerly covered by ſtrata of red ſchiſtus, including ironſtone, which have mouldered down. Much of the clay may have been waſhed away, leaving the ironſtone, which water could not eaſily carry from a flat ſurface.

But as we may afterwards have an opportunity of reconſidering this ſubject, we ſhall not enlarge further at preſent.

Connected with the latter, are ſeveral ſtrata of limeſtone, of a florid brick, or blood-red colour. Such limeſtone always occurs, where hæmatitical ſtrata preſent themſelves along the coaſt. We ſhall therefore take no further notice of this limeſtone, until we reach Currie, beyond which it was not obſerved.

A ſtratum about three feet in thickneſs, and formed into blocks of from three to four feet in length, attracts attention. This ſtone contains innumerable ſhells, chiefly madrepores, ſome of which exhibit a bright crimſon colour. The ground of the ſtone is ſomewhat calcareous, and in its fracture every way reſembles jaſper, of a chocolate colour. It may, not improperly, be called jaſpidean marble. Were it poliſhed, it would exhibit a ſtriking appearance.

Advancing onward, the ſtrata upon the beach are ſuddenly changed. White and grey ſandſtone, with ſometimes a mixture of yellow, occur, and are continued a great way.

In theſe the Cock coal is included. It is confined within an angular ſpace, formed by two ledges, or edge-ſeams of limeſtone, one from north-eaſt, the other from ſouth-eaſt, which meet at right-angles. To the north and ſouth of theſe ledges

ledges of limeſtone, though the white ſandſtone extends a long way, and includes numerous beds of black bituminated ſhiver and blaes, no ſtratum of coal has been found.

There are three or four ſeams of coal running parallel from north to ſouth; the principal, or main ſeam, being about fourteen feet in thickneſs. They dip nearly towards north-eaſt, at an angle of 45°. Pits were ſunk, and efforts uſed to work this coal, about fifty years ago; but as there is no harbour to export by ſea, and a road muſt be cut ſeveral miles through rocks, a ſalt-pan was built, to conſume the coal in the manufacture of ſalt. The undertaking ſeems not to have ſucceeded, and was ſoon abandoned.

This coal is of the ſame ſpecies with that at Kilkenny in Ireland; and there are ſimilar ſtrata in Ayrſhire, in Fifeſhire, and various parts of Scotland. It is blind coal, of uncommon excellence. It is not ſo apt to fall into powder as moſt other ſpecies, and, when freſh dug, it exhibits a metallic luſtre. It is hence called *glance* coal by ſome; but this word does not diſtinguiſh it from ſome of its own varieties, which have no luſtre; nor from ſome ſpecies of bituminated coal, which have a ſhining appearance. The word *blind* coal is more expreſſive of its peculiar property, in emitting neither flame nor ſmoke; as it con-

ſiſts of carbon, without any impregnation of bitumen.

I could not learn that the working of this coal was abandoned, becauſe it 'ſoon diſappeared,' as ſtated by Mr Jamieſon, p. 101.; but that, from its inacceſſible ſituation, they could not work it with profit. Boiling ſalt could hardly abſorb their refuſe, far leſs ſuch a quantity as would keep the pit conſtantly going. It is well known, that if there be not a demand ſufficient to abſorb all that is turned out, no coal can be worked with profit; and that the working cannot be abandoned and reſumed, according to the fluctuations of the demand; becauſe, in that caſe, men's wages would be running on, the machinery would be rotting, while the pit would be drowned with water.

Mr Jamieſon alſo ſtates 'the great frequency 'of baſaltic veins as another cauſe, which muſt 'render the coal, if it ſhould ever be detected, of 'an indifferent quality, and difficult to work.'

With regard to the baſaltic veins, I remarked it as an uncommon circumſtance in Arran, that I could not find a ſingle baſaltic vein in the coal-field, or as far as the white ſandſtone extended on each ſide of it. There did not therefore appear to be the ſmalleſt ground for believing that the coal was cut off, or its quality injured, by baſaltic veins.

When

When they wrought the main ſeam, by digging along its outcrop a large open trench, they came to the ſtrata which form the ſteep ſide of the mountain, and which here riſe at an angle of nearly 70°. They thought the coal extended through the baſe of the mountain, and cut a mine to follow it out. Had they beſtowed the ſlighteſt attention, they might have ſeen, that the ſtrata on the ſide of the mountain are very different from thoſe which include the coal; and that, when the latter touch the former, they ſuddenly terminate. The ſtrata on the ſide of the mountain appear to have been of much earlier formation, and they riſe at a much higher angle, than thoſe which include the coal. Nor does it appear that the quality of the coal was in the leaſt affected by its approach to the mountain; for it was equally good until it was cut off.

On examining the ſtrata perforated by their mine, I found them to be ſilicious ſandſtone flags, of great hardneſs, and of a browniſh-white colour, their ſurfaces exhibiting micaceous ſcales. They are from one to two inches in thickneſs, and are curiouſly bent upwards, into the form of a Gothic arch, or rather of a great many arches overlapping each other, which form the roof of their mine. It was uſeleſs to follow the coal from the ſtrata where it was found, into ſtrata ſo very different, both in quality and poſition. As far as I could

learn, the coal only failed them here, where they had no right to expect it.

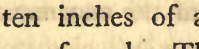
From the position of this coal, there can be no doubt but it expands to a great extent below the sea. If ever it be found convenient to work it, I conceive it should not be by sinking pits, but by sinking in the stratum itself, and drawing it up the inclined plane of sandstone, on which it rests, by carriages running upon rollers.

This coal, being esteemed pure carbon, and capable of producing a most intense heat, I am surprised it never has been applied to the smelting of iron, and other fornacic uses. The ironstone here seems inexhaustible, and of excellent quality. A harbour might be scooped out of one of the ledges of limestone, which enclose the coal-field; which would cost nothing, as the limestone would repay the expense with profit. From this, the coal and ironstone might be exported to a situation favourable for an iron-work.

Some strata of bituminated shiver, or shale, of a black colour, are visible, not only in the coal-field; but many are visible, for a great extent, on each side of it. These strata sometimes throw out an efflorescence of sulphate of magnesia.

But in one of the seams of coal which Mr Cowie had wrought in the way called *open stretch*, for the purpose of burning limestone, I observed a highly bituminated species of till, of a black colour. This appeared,

appeared ſo extraordinary, that I requeſted Mr Cowie to write down a deſcription of it, which follows.

'The ſeam of coal, at the Cock of Arran, 'wrought by James Cowie, is firſt about ten 'inches, then eight or ten inches of a dauchy 'till, then twenty inches of coal. The dauch 'which ſeparates the two ſeams of coal, is ar-'ranged in this manner  like the 'back-bone of a fiſh, and riſes in large pieces, 'but parts in the middle. The till between the 'two ſeams of coal ſerves to burn lime.'

Mr Cowie added, that the dauch was always mixed with the blind coal in burning lime. That it ſeemed to kindle more readily than the coal; and the only difference was, that the dauch always left a large *gueſt* (cinder); whereas the coal burnt into a fine white aſh, of very ſmall quantity.

Here, then, are highly bituminated ſtrata of clay, not only connected with blind coal, but one interpoſed between two ſeams of that foſſil.

Our men of fire make their favourite element operate as many contradictions, as the hocus-pocus tricks imputed to phlogiſton by the older chemiſts. At one time, phlogiſton could not penetrate the moſt porous bodies; at another, the moſt denſe were inſufficient to confine it. At one time, it was the cauſe of gravity and attraction; at another, of levity and repulſion.

Theſe

Theſe gentlemen aſſert, that blind coal has had its bitumen evaporated, by the great heat which elevated the ſtrata, from want of ſufficient preſſure to confine it; and that bituminated coal retained its bitumen, while ſubjected to this heat, in conſequence of the enormous preſſure which prevented its eſcape.

But I would aſk theſe gentlemen (if they are not too *hot* to give a *cool* anſwer)—How came the clay ſtrata, in the ſame alternation with the coal, to retain their bitumen, while the coal was deprived of it? But eſpecially, how came a ſtratum of clay, included between two ſtrata of coal, to retain its bitumen, while both the ſtrata of coal loſt theirs? I do not ſee how theſe gentlemen can anſwer theſe queſtions, in a way conſiſtent with their theory.

They refer us to the ſandſtone which covers the blind coal, and allege we ſhall find ſome traces of the bitumen there. But though I examined the ſandſtone ſtrata which formed the immediate roofs of the ſtrata of coal, and many others, with the utmoſt care, I could not find the ſmalleſt viſible trace of bitumen in them: nor could I trace the ſlighteſt mark of vegetable impreſſion, either in the ſandſtone, or in the bituminated ſhiver connected with the blind coal.

Bitumen, particles of coal, and remains of vegetables, I have always found in the ſandſtone ſtrata

ſtrata that covered bituminated coal; and often, in the coal itſelf, vegetable remains occur. Hence I inferred, that ſuch coal had been formed from vegetables; and the marks I formerly aſſigned of ſandſtone, including coal, applied only to bituminated coal. Blind coal appears to be *ſui generis*, and to have been formed without the aid of vegetables.

But without pretending to aſſign the mode of its formation, I think I am warranted to aſſert, it was not formed in the way our fiery philoſophers allege; and that the facts ſtated are fatal to their theory, as far as it depends upon preſſure, or defect of preſſure.

The ſtrata of white ſandſtone, and of bituminated ſhiver, occupy the coaſt only a ſhort way, on the north of the coal field; but on the ſouth they prevail for ſeveral miles.

Beyond the Cock coal, there is a farm called Laggan, where, what ſoil there is, appears fertile. Below this farm, a vaſt ledge of limeſtone is expoſed by partial working on the ſea-beach, and forms a ridge through the land. This is the ledge deſcribed as cutting off the coal in this direction.

It is of a blue colour, ariſing from bitumen; and contains many large oyſter, and other ſhells.

For a long way white ſandſtone continues, and alternates with ſtrata of blaes, of various, but many of very great thickneſs. Many of theſe latter

latter ſtrata include numerous ſtratulæ of carbonated ironſtone, of a blue, or black colour.

Theſe ſtrata dip at various angles, from north to north-eaſt. A few ſtrata dip in the oppoſite direction.

For about a quarter of a mile, the ſtrata are wacken porphyry, regularly dipping like the others. Here whinſtone veins, of a blue colour, again make their appearance, and interſect the ſtrata.

In one caſe, a vein of porphyry, varying between red and purple, containing white ſilky concretions of ſparry lime, interſects theſe ſtrata.

Beyond this, ſtrata of blue baſalt, ſubdivided into columns, of various, but none of great thickneſs, alternating with bituminated clay ſhiver, of a black colour, occupy a conſiderable portion of the beach. Theſe ſtrata obſerve the general dip, but not at ſo high an angle. Next, bluiſh ſandſtone, alternating with red ſhiver. Laſtly, red ſandſtone, alternating with puddingſtone, red ſhiver, and red ſlaty ſchiſtus. The ſhiver and ſchiſtus include many ſtratulæ, and are thickly interſperſed with hæmatites. Many of the ſchiſtic ſtrata, are partly red, partly white, in the ſame fragment. The latter do not ſeem to contain much hæmatites.

Intermixed with the ſtrata from where the white ſandſtone terminates, are ſeveral maſſy ſtrata of indurated clay, often poliſhed by the ſea. They are either of a white, or greyiſh colour, ſometimes varied

varied by ſpots of faint red, or purple. They ſeem highly deſerving the attention of potters.

The farm of Laggantwine is the third and laſt upon the ſide of this mountain. It is ſituated in an elevated corry, or hollow, ſcooped from the ſide of the mountain. Soil moſtly of a red colour, being formed from the decompoſition of the ſtrata which had formerly leaned towards the ſchiſtus here; and much more might be gained than is actually cultivated.

On the north-eaſt ſide of this corry, the micaceous ſchiſtus is projected towards the ſea, and forms a mountain of curious conſtruction. The ſchiſtus is ſuddenly cut off by a perpendicular vein of primary puddingſtone, conſiſting of ſtones of various ſize, moſtly angular, inſerted in a ſchiſtic ground, of a bluiſh grey colour. Next to the perpendicular vein of puddingſtone, a great many ſtrata of calcareous puddingſtone lean towards the mountain. Thoſe next it are almoſt perpendicular, but they deviate as they recede, and the outermoſt forms an angle of about 80°, dipping towards north-eaſt. All theſe ſtrata riſe to the ſummit of the mountain.

The calcareous puddingſtone contains rounded pieces of quartz, jaſper, flint, red ſandſtone, and ſandſtone ſchiſtus, diſperſed in a ground of indurated chalk. The ſtrata of this deſcription form the

the external covering, facing the ſea, in which the concretions ſometimes ſuperabound, ſometimes the chalk.

Many of the interior, and parts of the exterior ſtrata, are compoſed of rounded pieces of white indurated chalk, inſerted in a grey ground of the ſame material, without any apparent mixture of flinty concretions. Theſe ſtrata are, in fact, calcareous puddingſtone.

This mountain cannot be viewed from the ſea-beach without aſtoniſhment; and as numerous fragments have fallen from the lower parts of the external ſtrata, ſo as to leave them, apparently, only a pivot to reſt upon, our aſtoniſhment at their grandeur is mixed with fear of their ſudden fall.

In the ſame line of bearing, which is nearly from ſouth to north, the ſame ſtrata are found within tide-mark, and jut occaſionally through the ſoil on the ſea-beach. In the firſt caſe, they are moſtly covered by ſand and chingle; in the laſt, by ſoil.

It would be eaſy to cut a commodious harbour through theſe ſtrata, from the ſea, the value of the limeſtone more than defraying the expenſe. After this is done, a few blaſts inſerted in the baſe of the ſtrata, to be fired by a train which might allow the workmen time to eſcape, would bring down the whole ſide of the mountain, and afford materials

materials from which limeſtone of the beſt quality might be ſelected, ſufficient to ſupply the conſumption of ſeveral generations.

Beyond Laggantwine, the firſt viſible rocks are a mountainous ridge of pudding ſtrata, of enormous thickneſs, which projects towards the ſea. Where this ridge approaches the ſea, immenſe maſſes have fallen down, and encumber the beach; producing a wild and romantic effect; but not unpleaſant, as there is an eaſy paſſage through them. Moſt of the pudding rocks here have a calcareous ground, and ſome would even make lime.

Beyond this promontory, the ſame ſtrata ſeemed to be continued, though not ſo maſſy; and the acclivity of the mountains begins to be much leſs abrupt, until the ſea-bank becomes low, and the land riſes gently from the ſea.

Below the farms of North and South Sannox, there is a bold projection of pudding rock, with an extenſive plain on each ſide of it, and a level parterre between it and the ſea. This rock is covered, and ſurrounded, on either ſide, with natural woods, of great extent; and the ſemicircular parterre in front of it, is the moſt beautiful and romantic ſpot I ever beheld.

Did not obſerve any whinſtone veins penetrating theſe pudding rocks; and whether they penetrated the ſtrata on the ſhore, I had no opportunity

nity of obſerving. When benighted in ſuch ſituations, without guide or attendant, an obſtacle is thrown in the way of deliberate obſervation; and the fear of breaking one's neck, induces a neceſſity of employing the faint glimmering that remains, in ſcrambling towards quarters.

CURRIE,

CURRIE, &c.

From the Sannox to Arran Caſtle, the ſea-bank is generally low, and ſometimes ſlopes down to the beach. An extenſive terrace, of from one to two miles in breadth, is projected from the baſe of the mountains towards the ſea. This terrace is cultivated in ſome places; but it exhibits extenſive tracts, of excellent ſoil, on which cultivation has never operated. Some places are wet and ſwampy, but might eaſily be drained. Others are encumbered with ſtones, and ſhould be planted. In many places, the mountain torrents have cut through this terrace deep ravines, which are ſkirted by natural wood. Much natural wood abounds at the Sannox and Currie, which, were it preſerved, might become valuable.

The mountain called Cir Mhōr (*Great Comb*, or *Creſt*) above Currie, from ſome points of view appears like a vaſt building flanked by two maſſy towers. Between this mountain and Cich-na-h'nighean (*Virgin's Breaſt*), a vaſt corry, or hollow, is ſcooped out, which exhibits a ſcene rocky and wild. A ſtream of water flows from it, which is fed by ſprings burſting from the baſe of the

rocks. As there is only a very ſmall barrier of ſchiſtic rock, facing this mountain, it is probable the corry may have been produced by water accumulating in a perpendicular hollow, until its preſſure overcame the lateral barrier, as was ſtated reſpecting Ceim-na-Cailich. This corry is rounded on all ſides to its ſummit, the ſides being formed of looſe blocks; which ſhows there are no veins here of large maſſes, which always form the precipitous ſides of granite mountains.

Deſcending by the ſmall ſtream which flows from this corry, the granite begins to be ſtratified with conſiderable regularity. In one place, it is interſected by a large vein of puddingſtone, conſiſting of fragments of quartz and granite, inſerted in a ſchiſtic ground of a bluiſh grey colour. Towards the ſouth, this vein ſwells into little hills. Below this vein, the granite reſumes its former regularity, and is ſoon intercepted by micaceous ſchiſtus, of which the barrier is thin; then primary puddingſtone occurs, of a ſchiſtic ground; and, laſtly, red ſandſtone.

Cich-na-h'nighean has a moſt ſtupendous pyramidal pillar of equal altitude with the mountain from which it has been detached, in many points of view very much reſembling a virgin's breaſt, which has occaſioned the name of the mountain. In this pillar, the granite exhibits a confuſed arrangement, without any regular ſtratification.

To

To the north of this, a very deep glen is ſcooped in the granite mountains, from which the water of South Sannox flows. Its mouth is bounded by Cich-na-h'nighean on the ſouth, and by Suidh (*The Seat*) on the north.

Deſcending into this glen, found it penetrated far into the granite mountains, and, like the corry of Cir Mhōr, was bounded by rounded ridges of granite. The glen, and the channel of the ſtream for a conſiderable way below, are encumbered with rounded blocks of granite; but, on following the ſtream, ſtratified granite occurs—then ſchiſtus—then primary puddingſtone of a ſchiſtic ground—then ſtrata of red pudding and ſandſtone alternate, until they reach the ſea-beach. The latter are frequently interſected by veins of hard blue whinſtone.

At one part of South Sannox water, large and irregular veins of ſpathum ponderoſum, or ponderous ſpar, interſect the pudding and ſandſtone ſtrata. Some of theſe are of great magnitude, and exhibit a lamellated ſtructure, with ſmall red, or black ſtreaks, the latter probably owing to lead. Other parts are a ſort of ſpathic puddingſtone, and include rounded pieces of quartz, and even rounded pieces of ſandſtone.

Theſe veins run due north; and there is no opportunity of tracing them in the diſtrict between South and North Sannox waters, becauſe the ridge

is moſtly covered with heath, or with natural wood. Perhaps when the land is torn up, and reduced to cultivation, this ponderous ſpar may be found jutting to the ſurface, and may include ore of lead.*

But in the channel of North Sannox water, at the diſtance of nearly two miles, two ſmall veins of the ſame ſpar were ſeen running in the ſame direction with thoſe in South Sannox water; and the ſpace betwixt them is occupied by a very broad vein of whinſtone.

The ſtrata in North Sannox are ſimilar to thoſe deſcribed in South Sannox; and at the mouth of the former river there is a bed of peat-moſs within tide-mark.

Above where the road from Glen Ranſa croſſes North Sannox, the primary puddingſtone commences. A ſtriking ſingularity occurs here, viz. a broad vein of irregular blue ſlate, interſecting the puddingſtone.

The puddingſtone forms jutting rocks on the ſouth ſide of the glen; then ſchiſtus occurs; and, laſtly, the granite of Ceim-na-Cailich; from whoſe boſom the main ſtream iſſues, as formerly deſcribed.

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* Since this was written, having accidentally looked into Mr Pennant's Tour to the Hebrides, I ſaw he had obſerved theſe veins, and had formed the ſame opinion of their contents I have here expreſſed.

The general inclination of moſt of the ſtrata, from Loch Ranſa to the Sannox, is, more or leſs, towards the north. But here the inclination begins to obſerve a contrary direction, and is pointed, more or leſs, towards the ſouth.

Leaving the limeſtone for future conſideration, the general ſtrata along this beach are red ſandſtone, alternating with puddingſtone. Sometimes the ſea-bank is a perpendicular rock of puddingſtone, which ſeems to reſt upon the laſt mentioned ſtrata; and frequently theſe ſtrata are ſeen to paſs under a pudding ſtratum of great thickneſs.

The red ſandſtone includes many ſtrata of red ſhiver, or ſlaty ſchiſtus; and theſe, again, contain many ſtratulæ, or are thickly diſſeminated with hæmatites, or kidney ore of iron. The ironſtone continues to occur, in great quantities, to the diſtance of more than a mile to the ſouth of Currie; beyond which, no more of it was obſerved.

There are alſo ſeveral ſtrata, of great thickneſs, of indurated clay, ſome of which ſeem well adapted for making fire-bricks; others for the potteries; though none of the latter ſeemed to equal, in purity, ſome that occurred further north.

Theſe ſtrata are frequently interſected by whinſtone veins; and, near the burn of Currie, there is a large irregular vein, or rather blotch, of porphyry, ſimilar to other veins further north. It conſiſts of various concretions, the principal of

which are white ſilky pieces of ſpar of lime, inſerted in a vivid red ground, variegated with nebulæ, and ſtreaks of purple. It alſo exhibits large rounded blocks of blue whinſtone, or baſalt, immerſed, and firmly cemented in it. When any of theſe are knocked out, they leave a hollow diſtinctly moulded by their ſhape.

At the Currie, there are immenſe ſtrata of ſandſtone, of a fine grain, and pure white colour. Theſe ſtrata form two ſeries. The one to the north is harder, coarſer, and not ſo white, as the ſeries towards the ſouth. The ſouthern ſeries has a harbour cut out of the ſolid rock, which admits veſſels for its exportation. Between two ſtrata of this ſtone, a bed of bituminated clay ſhiver, of a dark blue colour, is viſible, which might afford ſome hope of coal under the ſtrata. But the inclination of the ſtrata being towards the ſouth, is rather unfavourable to coal, as far as my very limited experience in theſe matters extends; and, if coal were here, it muſt be ſeen in the outcrop of the ſtrata on the ſea-beach.

We ſhall now enumerate the various limeſtone ſtrata in this diſtrict, beginning with thoſe ſituated towards the north.

1. In South Sannox farm, a vaſt rock of limeſtone riſes from the ſea-beach, and runs up through the moors, until it approaches the mountains. In ſome parts this is a puddingſtone, containing round-

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ed pebbles, and pieces of ſandſtone, inſerted in a ground of white indurated chalk. In other parts, no extraneous concretions appear. It conſiſts of ſeveral beds of great thickneſs, of which the bottom is not expoſed to view. The ſuperficial bed contains great numbers of pebbles, while in thoſe below, none are viſible. No ſhells appear in this ſtone; and it ſeems well adapted for being wrought by mining, leaving the ſuperficial bed as a roof.

2. In Currie Burn, there is another vaſt body of limeſtone, which riſes from the ſea-beach, and runs a long way up the ſide of the burn, and paſſes over the hill towards the mountains. At the mouth of the burn its outcrop has been ſwept away, and covered with rubbiſh. This is of the ſame quality with,

3. The quarry now working, and which has been wrought to a conſiderable extent. It riſes from the ſea, where the ſtratum has been ſcooped out, ſo as to form a harbour for its exportation to Greenock, Glaſgow, and various other places. It riſes along the hill, parallel to the other ſtrata, and to the white ſandſtone already deſcribed. The ſtratum conſiſts of fifteen beds, alternating with thick beds of rich marly ſhiver, of a red or purple colour; ſo that for light, ſandy, or chingly ſoils, the rubbiſh of this quarry would anſwer much better than lime. The ſtone is of a blue, or purple colour, and contains numerous ſhells, chiefly large

oyſters and clams, which retain their natural ſhape. The marl alſo contains ſome ſhells; but they are generally compreſſed, or broken into fragments. Often it exhibits broken impreſſions of ſhells, where no ſhell actually remains.

4. South of the Sandſtone Harbour, there is a ſeries of limeſtone ſtrata, of a florid blood, or brick-red colour, which alſo riſes over the hills. I formerly deſcribed a ſimilar ſtratum of limeſtone at the Cock; and ſeveral other ſtrata, of the ſame appearance, occur in the extenſive tract between the Cock and Currie. As this ſtone ſeems to contain no other alloy but iron, it would be worth while to try whether, without the addition of puzzolana or terras, it would not make cement for buildings under water.

5. South of this there is another vaſt ſtratum of limeſtone, running over the hills, called the Caſcade Quarry, from a beautiful caſcade that falls over a rock below. This ſtratum is not viſible on the ſea-beach, being probably covered with chingle and ſtones. It is of the ſame quality with the quarry now working, but it never has been wrought.

6. About a mile ſouth from Currie, and about a mile above the ſea-beach, in the ſide of a hill, there is a ſtratum of limeſtone called the South Quarry, which has been wrought to a conſiderable extent. It contains the ſame number of beds with

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the Currie Quarry, only they are thinner. In all other reſpects they are ſimilar. They reſt on red and purple marly ſhiver, and are covered by white ſandſtone. A road has been made from this quarry to the ſea-beach, where a ſmall harbour is formed of looſe ſtones for its exportation. There is reaſon to believe that this ſtratum, though concealed by earth and ſtones, deſcends to the ſea-beach; and that it may be found entering the ſea at a ſmall ſandy bay, north of the harbour juſt mentioned.

All theſe ſtrata, and thoſe connected with them, incline towards the ſouth at an angle of about 45°; and their line of bearing, or outcrop, riſes from eaſt to weſt, with the acclivity of the land, towards the granite mountains.

Natural magnets have been found on the ſea-beach below the South Quarry, probably detached from a ſtratum of ironſtone by the ſea. Though I ſearched, I found none.

SEA-

SEA-BEACH TO ARRAN CASTLE.

One circumſtance ſtrikes us upon this beach, *viz.* the enormous maſſes of granite which are ſcattered on ſeveral parts of it. Some of theſe are like detached rocks, and are not much rounded, not having had a long journey from the neighbouring mountains: though many of the ſmaller blocks are conſiderably rounded, theſe having been carried down by ſtreams, while the firſt rolled down by their immenſe weight, when the mountains were much higher, and the projecting declivity much ſteeper than they are now. A remarkable ſtone of this ſort, whoſe weight may be from thirty to forty tons, and conſiderably rounded, reſts upon a narrow ledge of puddingſtone, below the farm of South Sannox, where the road is cut through. It is hardly credible that this ſtone could have rolled into its preſent poſition by accident. Its reſting on a pivot, and having its edge propped by a ſmall block of granite, ſeem to indicate that it was placed there by deſign. But how they could contrive to move ſuch a maſs, though found contiguous, or to elevate it to its preſent poſition, when mechanical powers were unknown,

unknown, exceeds my comprehenſion. This ſtone very much reſembles the rocking ſtones at Glennevis, and other parts of the North Highlands, ſome of which move by the wind, and by which the Druids pretended to foretel future events. Many of theſe ſtones have been thrown from their pivots, and can no longer be moved; and, whether this was a rocking ſtone or not, it was probably an implement of ſuperſtition.

A much larger maſs is ſeen reſting on rounded blocks, beneath which the laſt of Cromwell's ſoldiers is ſaid to have ſought concealment, but was there overtaken and ſlain.

The ſtrata ſouthward from the South Quarry harbour, are moſtly red ſandſtone, curiouſly interſected by cracks, or ſlips, which occaſion perpetual variations in the line of dip. Theſe ſtrata are often compoſed of thin laminæ, whoſe outcrops look like large fans, or like leaves of the palm-tree overlapping each other. They are interſected by numerous whinſtone veins. One large vein runs a long way from north to ſouth; then ſuddenly forms a curve, and runs eaſtward. It has a ſmaller vein, of a darker blue whinſtone, in the ſame chaſm, on its weſt ſide. The latter does not bend round with its aſſociate, but continues onward in a right line, and ſoon cuts a larger vein, at an angle of 45°, without intermixture of ſubſtance. It ſeems as if the firſt large vein diſdain-

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ed to travel further with ſuch a puny aſſociate, and hence he flies off from him at right angles; while the other, indignant, takes his revenge on the firſt great vein he meets, by cutting him in two.

But what is moſt remarkable along this beach, is numerous veins, of various dimenſions, ſome not thicker than a quarter of an inch, ſome ſeveral feet over, of red ſandſtone. Theſe veins are harder, and are either of a paler or deeper red, than the ſtrata which they interſect. Sometimes they are cut off, and ſometimes have their direction changed, by the whinſtone veins. When broken acroſs, they can be ſeen diſtinctly to penetrate the ſtrata, moſtly in a perpendicular, but ſometimes in a ſlanting direction. Where they are thin and numerous, they mark the ſurface of the ſtrata into many whimſical compartments. I noticed a vein of this ſort, as forming the key-ſtone of the Gothic arch of King's Cove. Near Arran Park, there is a projecting peninſula, forming the northern mouth of Broddick Bay, which exhibits many large veins of this ſort. At one place, a ſlip changes the red ſandſtone to white. A ſandſtone vein interſects both; which, before it leaves the red ſandſtone, has a mixture of white; but when it enters the white ſandſtone, it becomes wholly white.

DESCRIPTION OF THE STRATA

MENTIONED AND REFERRED TO IN

THE PRECEDING SURVEY.

By Dr WALKER.

The late Dr Walker eſteemed a knowledge of the ſolid ſtrata of the earth the moſt important part of Mineralogy; as in them the metallic ores, and all the more valuable minerals, are ſituated. He arranged theſe under two grand claſſes, the Petræ and Saxa. The firſt forming the lower hills; the laſt the higher mountains.

The Petræ he defined to be *ſimple rocks*, foſſils which are either craggy or ſtratified, appearing to the naked eye to be compoſed of one and the ſame material.

The Saxa he defined to be *compound rocks*, foſſils which are craggy or ſtratified, amorphous, compoſed

compoſed of a ſubſtramen and various concretions.

The PETRÆ he arranged under four orders, each order including a number of genera.

The SAXA he arranged under nine orders, each including a number of genera.

To each genus he affixed the name which had been uſed by Pliny and other ancient authors; but he was careful to note the ſynonymes which had been uſed by more modern authors, or which prevailed in the vulgar dialect of this and of other countries.

In deſcribing the various genera, it was not his object to enumerate all the properties which belonged to each individual, (a practice which has lately rendered Mineralogy a maſs of unintelligible jargon), but to ſelect thoſe diſcriminating characters by which one ſtone is diſtinguiſhed from another.

The diſcriminating characters of foſſils he arranged under the following heads; which, though not repeated in the following deſcriptions, are underſtood to be implied.

NATURAL CHARACTERS.
SITUATION.
SUBSTANCE.
CONSISTENCE.
FIGURE.
STRUCTURE.
PARTS.

PARTS.
QUALITIES.
CHEMICAL CHARACTERS.

In the preceding pages, all the peculiarities of the rocks are deſcribed as they occurred. What follows is not a connected ſeries of Dr Walker's deſcriptions of the genera of rocks, but a ſelection of his deſcriptions, expreſſing their general and diſcriminating properties, moſtly in the order in which the rocks occurred to me in Arran. Stones not included in his ſyſtem have already been deſcribed, or ſhall be deſcribed afterwards.

Note

Note [A.] SANDSTONE. p. 39.

SYMPEXIUM.

Scytheſtone or Rubber. *Woodward*'s foſſils, Part I. p. 17—32. Saxum, 10. *Da Coſta*, p. 132. Grainſtone, *Brown*'s Jam. p. 50. Arenarius granularis, *Waller*, Syſt. I. p. 195. Sandſtone with an argillaceous cement, *Cronſt.* § 276. p. 1. 3.

Engliſh: ſandſtone, grindſtone, ſeedſtone, crowſtone. Scotch: commonly called freeſtone.

Natural Characters.

Sit. Secondary. Strata horizontal, oblique, elevated, very thick.

Subſt. Aggregated. Subſtramen argillaceous. Concretions quartzoſe, micaceous.

Conſiſt. Cuts with a chiſel. Poliſh rude, dull, arenaceous. Does not tranſmit light. Fracture plain.

Fig. Amorphous.

Struct. Indeterminate, arenaceous.

Parts. Fragments of the Strata quadrangular. The quartzoſe particles, amorphous; the micaceous, ſilvery.

Qual. Colour white, whitiſh, grey; but, impregnated with ochre of iron, it is red, or yellow.

Chemical

Chemical Characters.

Reſiſts the air, though it is ſometimes decompoſed by expoſure to it. Vitreſcible into a ſolid hard glaſs. *Waller.*

Note [B.] Red Ferruginous Clay or Shiver, p. 39.

Thyites.

Clayſtone, *Woodward*, II. p. 99. Schiſtus fragilis, *Waller*, I. p. 341. Argillaceous ſlate, *Born.* Engliſh ſill. Vulgo, primitive argillaceous ſlate.

Natural Characters.

Sit. Primitive. Strata vertical, elevated, fiſſile.

Subſt. Homogeneous, earthy, argillaceous. Often contains ſmall veins of quartz; but never extraneous foſſils.

Conſiſt. Does not tranſmit light. The ſtratulæ full of cracks, fragile. Pounded, its duſt is of the ſame colour, but more pale; ſometimes friable; aſſumes no tegmen.

Fig. Amorphous.

Struct. Indeterminate. Pecten ſcarce palpable.

Qual. Black, duſky, cinereous, red, yellowiſh, greeniſh.

Chemical Characters.

Crackles in the fire. With a ſtronger heat is melted into a frothy ſcoria. *Waller.*

Obſervation. Contains ſmall veins of quartz, but no extraneous bodies.

Note

Note [C.] MOLARIS and BRECCIA, p. 39.

MOLARIS.

Lapis molaris, *Valmont*, Sp. 144. Molaris, Scopoli Princip. p. 59. Britiſh millſtone.

Natural Characters.

Sit. Secondary. A coacervated rock, ſcarce ſtratified.

Subſt. Aggregated; ſubſtramen arenaceous; concretions rounded, angular, unequal, of various kinds.

Conſiſt. The ſubſtramen does not tranſmit light; the concretions often ſtrike fire with ſteel.

Fig. Amorphous; free of veins.

Struct. Indeterminate; but the concretions are often of a regular ſtructure.

Parts. The quartzoſe concretions are rounded; the ſchiſtoſe angular, together with the fragments of other primitive rocks; is the peculiar matrix of gravel, or ſmall ſtones.

Qual. The colour of the ſubſtramen is various; moſt frequently grey, or red.

Chemical Characters.

The ſubſtramen ſometimes effervesces; often grows harder by expoſure to the air.

Stomoma.

Saxum amnigenum, *Linn.* Breccia, *Waller.* I. p. 427. n. 3. The breccia of authors.

Natural Characters.

Sit. Secondary. Craggy, coacervated, ſometimes ſtratified, in beds variouſly inclined.

Subſt. Conglutinated; ſubſtramen ochreous; concretions of various ſtones, eſpecially the primitive; often ſchiſtoſe.

Conſiſt. Impervious to light; fracture rude; poliſh none; often exhibits holes.

Fig. Amorphous.

Struct. Indeterminate; fracture irregular, very rough.

Parts. Concretions often earthy, angular.

Qual. Subſtramen ſometimes red, often yellow; the concretions of various colours.

Note

Note [D.] BLOTTA. PRIMARY BRECCIA, or PUDDINGSTONE, p. 39.

BLOTTA.

Argillaria, *Brown's Jam.* p. 66. Balkſtone, *Born*, p. 112? Breccia arenacea, *Cronſt.* Scotiſh till-band.

Natural Characters.

Sit. Secondary. A coacervated rock, ſcarce ſtratified.

Subſt. Subſtramen argillaceous. Concretions rounded, angular, of various ſpecies.

Conſiſt. Subſtramen impervious to light. Concretions often give ſparks with ſteel. Fracture irregular. Cement ſcarce palpable.

Fig. Amorphous.

Struct. Indeterminate.

Parts. Free of veins.

Qual. Colour of the ſubſtramen various; moſt frequently blackiſh, or grey.

Chemical Characters.

Moulders in the air. Inſoluble.

Obs. Free of veins.

Note [E.] Grey Granite, p. 41.

Psaronium.

Granitum, *Valmont*, Sp. 182. n. 3. Pſaronium, *Da Coſta*, p. 280. *Woodward*'s foreign foſſils, p. 4. Appendix, p. 4. Granites, *Waller*, I. p. 407.

Britiſh grey granite. Engliſh moorſtone. Hard growan, Cornwall. Peaſy whin, Aberdeen. Granitello, Italy.

Natural Characters.

Sit. Primitive. Strata vertical, very thick, very ſolid.

Subſt. Conglomerated, water-borne. No apparent ſubſtramen. Concretions, fellſpar, quartz, mica.

Conſiſt. Gives fire with ſteel; very hard; does not obey the chiſel. Fracture ſomewhat plain, rough. Poliſh like that of marble.

Fig. Amorphous.

Struct. Granulated with grains of various ſize and figure, ſometimes however equal, very ſmall.

Parts. Concretions of fellſpar cubical, lamellated. Concretions of quartz amorphous. Concretions of mica lamellated. Fragments of the ſtrata parallelopiped, of immenſe ſize.

Qual.

Qual. Fellſpar white; quartz more white. Mica black, ſometimes whitiſh. Fellſpar and quartz, ſubdiaphanous. Black mica opaque, white, pellucid.

Chemical Characters.

Hardens in the air. Moulders in the fire.

Obs. 1. Beſides black mica, white pellucid mica is often found in granite; which never occurs in ſyenite.

2. Powdery cryſtallyzed calcareous earth often exiſts in granite.

Note [F.] Micaceous Schistus, p. 47.

Lepidotes.

Saxum fornacum, *Linn. Cronſt.* p. 242. Saxum tritorium, *Linn. Cronſt.* p. 244. Hornſlate, *Ferber*, p. 327. Lepidotes reſembles the ſcales of fiſhes, of various colours, *Agricola*, Nat. Foſs. Lib. 5. Saxa fornacum, *Waller*, I. p. 410. Saxum Mareſtrandenſe, *Linn.* Stone compoſed of quartz and mica, *Gussmanni* Lithophyl. Mitiſian. p. 443. Saxum Molinum Garpenbergenſe, Rocroſienſe, Montanum, *Linn.*

Britiſh: Scaleſtone. German (vulgo) gneiſs.

Natural Characters.

Sit. Primitive. Strata vertical, fiſſile.

Subſt. Conglomerated. Concretions, mica and quartz variouſly interwoven.

Conſiſt. The quartz gives ſparks with ſteel, the mica none. Does not obey the chiſel.

Fig. Amorphous.

Qual. The micaceous part is golden, ſilvery, greeniſh, blackiſh; the quartzoſe white.

Chemical Characters.

The extremities of the ſtrata, broken acroſs, long reſiſt the violence of the fire. Hence its name by Linnæus and Wallerius, from its uſe in the conſtruction of furnaces.

Note

Note [G.] RUBBLE, or BASTARD FREESTONE, p. 48.

SCYRUS.

Freeze, or Burſtone, *Da Coſta*, p. 127. Sandſtone with an unknown cement, perhaps argillaceous, *Cronſt.* § 276. n. 3. Cos cotaria, *Linn.* Rubble, or Rubbleſtone, *Kirwan.*

Scottiſh: commonly baſtard freeſtone; baſtard whinſtone. Engliſh: freeze. Elvan.

Natural Characters.

Sit. Primitive. Strata vertical, very thick.

Subſt. Conglutinated. Subſtramen ſcarce manifeſt, argillaceous. Concretions moſt frequently ſilicious, very ſmall, nearly equal; ſometimes micaceous, ſchorlaceous.

Conſiſt. Gives ſparks with ſteel. Does not obey the chiſel.

Fig. Amorphous.

Struct. Indeterminate, arenaceous. Fracture angular, irregular. Pecten palpable.

Qual. Its moſt frequent colour reddiſh.

Note

Note [H.] Wacken Porphyry, p. 61.

Glomellaria.

Scottiſh: Ratchell.

Natural Characters.

Sit. Primitive. Strata vertical, thick.

Subſt. Conglutinated. Subſtramen, earthy, argillaceo-ſchiſtoſe. Concretions, quartz, felſpar, ſchorl; ſometimes zeolite, angular.

Conſiſt. Impervious to light; brittle; does not obey the chiſel. Poliſh, none.

Fig. Amorphous.

Struct. Indeterminate. Fracture angular, rough. Pecten ſcarce palpable.

Parts. Fragments of the ſtrata amorphous.

Qual. Subſtramen blackiſh, dark grey, aſh-coloured. Concretions white, ſhining.

Note

Note [I.] SYENITE, p. 62.

[This ſtone is ſo called from Syene in Upper Egypt, where it abounds. The ancient Egyptians conſtructed many of their temples and obeliſks, adorned with hieroglyphicks, of this ſtone. They even cut large rocks of it into gigantic ſtatues. If a monument is to be erected to our naval heroes, the baſe, at leaſt, ſhould be of this ſtone; that when the column itſelf has mouldered into duſt, the baſe may tranſmit their glory to poſterity. It abounds at Sandſide in Caithneſs, and many other parts of Scotland.]

SYENITES.

Syenites, *Plin.* Lib. 36, cap. 8. Granites Orientalis, *Waller*, I. p. 407.

Britiſh: Syenite. Red granite. Granito roſſo of the Italians.

Natural Characters.

Sit. Primitive. Strata vertical, very thick, very ſolid.

Subst. Conglomerated, water-borne. No manifeſt ſubſtramen. Concretions fellſpar, quartz, mica; ſometimes cryſtallized ſchorls.

Fig. Amorphous.

Struct.

Struct. Granulated, with grains of various magnitude and figure.

Parts. The concretions are ſeparable by a blow. Concretions of fellſpar are quadrangular, lamellated. The concretions of quartz are amorphous. The concretions of mica are lamellated. The fragments of the ſtrata are parallelopiped, of immenſe ſize.

Qual. The fellſpar is red; quartz, white; mica black. The fellſpar is ſlightly tranſlucent; the quartz, ſubdiaphanous; the mica, opaque.

Chemical Characters.

Stands the fire; afterwards gives ſparks with ſteel. Vitrifiable into a white ſemipellucid glaſs. The iron with which the fellſpar is coloured, in a vitrifying heat, becomes volatile. Inſoluble in acids.

Obs. Large, yellow micaceous concretions, of a rhombic figure, are ſometimes found in ſyenite, which are never found in granite.

Note

Note [K.] BASALTIC COLUMNS, p. 77.

BASALTES.

Baſaltes, *Plin.* Lib. 36. cap. 7. *Pott.* Lith. II. p. 219. Pierre de Stolpen, *Valmont*, vol. I. p. 134. Hill's Theophraſtus, p. 111. Black columnar porphyry of Ireland, *Brown*'s Hiſt of Jam. p. 49. Baſaltes, *Boethius* de gemmis, Lib. 2. cap. 273. *Hill*'s Hiſt. p. 467. Marmor Stolpenſe, ferreo colore et duritie, *Kentmanni* Nomenclat. p. 53. Baſaltes, a ſtone which conſiſts at leaſt of four angles, and at moſt of ſeven. *Geſner* de figuris lapidum, p. 20. Black granite, *Forſter*, p. 22. Baſaltes, *Wolterſdorf*, p. 19. Baſaltes, *Bergman.* Act. Upſal. Nov. vol. III. p. 22. Baſaltes columnaris, *Baumer.* Regn. Min. p. 236. Baſaltes, *Worm.* Muſ. p. 44. Baſaltes, *Agricola* de Nat. Foss. Lib. 7.

Engliſh: Baſalt.

Natural Characters.

Sit. Primitive. St atified in beds horizontal or oblique, very thick; with vertical angular fragments.

Subſt. Aggregated. Subſtramen, earthy, ſchiſtoſe, black, or aſh-coloured. The concretions are quartz or ſchorl, ſmall, ſometimes mica, interſperſed.

interſperſed. Concretions of ſpar and zeolite are adventitious.

Conſiſt. Impervious to light, very hard, reſiſts the chiſel. Poliſh, ſcarce approaches to that of marble. Fracture, ſomewhat plain, ſomewhat rough.

Fig. The fragments of the ſtrata are columnar, priſmatic, for the moſt part hexagonal, contiguous, not adhering; with unequal ſides. The columns are continuous or jointed, of all figures, from trihedral to octohedral. The moſt common figure is hexahedral.

Struct. Indeterminate. Sometimes ſcarce palpable.

Parts. The ſides of the columns are plain, ſtraight, ſometimes curved.

Qual. Colour, black or grey. Is attracted by the magnet. Specific gravity 3000, *Bergman.* Rings when ſtruck.

Chemical Characters.

Vitrifiable in a violent heat. Its glaſs is ſcoriform, black, compact, giving fire with ſteel. Incalcinable, *Pott.* In the fire fuſible by itſelf, *Bergman.* Inſoluble in acids. By roaſting grows red. By fixed alkali vitrifiable into a black, or blue, opaque glaſs.

Compoſition

Compoſition—Silicious earth	-	56
Argillaceous	-	15
Calcareous	-	4
Iron	-	25
Bergman	-	100

Obs. It wears metals by writing, and ſhows their colours. Hence its uſe as a touchſtone.

Note

Note [L.] - FATISCENT WHINSTONE, p. 85.

AMYTHON.

Amiantine Rock.

Natural Characters.

Sit. Primitive. Strata vertical.

Subſt. Aggregated. Subſtramen ſchiſtoſe. Concretions, amianthus, aſbeſtus; eſpecially amianthus interwoven. *Linn.*

Conſiſt. Impermeable to light. Fracture rude, rough. Poliſh, none.

Fig. Amorphous.

Struct. Indeterminate. Pecten ſcarce palpable. Concretions fibrous, or radiated.

Qual. Colour approaching to black, dark.

Note

Note [M.] WHINSTONE, or BASALT, p. 96.

SIDEROPOECILON.

Saxum cotarium, *Waller*, I. p. 417. Saxum cotarium, *Linn.* Saxum ferreum, *Waller*, I. p. 420. Baſaltes amorphus, *Baumer.* Regn. Min. p. 236. Mullenſtone, *Kirwan*'s Elem. I. p. 225. Kraggſtone, *Kirwan*'s Elem. I. p. 226.

Scottiſh: Whin, Whinrock, Whinſtone.

Natural Characters.

Sit. Primitive. Strata vertical, lofty, thick.

Subſt. Conglutinated. Subſtramen earthy, ſchiſtoſe. Concretions ſchorl, quartz. Concretions of mica, fellſpar, zeolite, adventitious.

Conſiſt. Impervious to light, very hard, reſiſts the chiſel. Fracture angular. Poliſh rude.

Fig. Amorphous.

Struct. Indeterminate. Pecten ſcarce palpable.

Parts. Fragments of the ſtrata vertical, elongated, angular. By expoſure to air and water, it acquires a whitiſh tegmen, or cruſt.

Qual. Colour black, dark-blue, aſh, whitiſh. Rings when ſtruck.

Obs. 1. Is often the matrix of metallic veins.

2. In the illuſtrious Electoral Muſeum of Dreſden, ſtones of this genus are diſtinguiſhed by Pliny's name of Syderopoecilon.

Note

Note [N.] PORPHYRY, p. 125.

LEUCOSTICTOS.

Porphyr. *Valmont.* Sp. 180. Porphyrites, *Plin.* Lib. 36. cap. 7. Porphyr. *Waller.* Syſt. I. p. 414. Porphyry, *Kirwan*'s Elem. p. 151. Leucoſtictos, *Cesalpinus* de Metall. Lib. 2. cap. 16. Leucoſtictos, *Plin.*

Britiſh: Porphyry.

Natural Characters.

Sit. Primitive. Strata vertical.

Subſt. Aggregated. Subſtramen water-borne, jaſpidean, but harder. Concretions diſſeminated; of fellſpar quadrangular, angular; ſometimes of quartz, ſchorl, rarely of mica.

Conſiſt. Subſtramen gives fire with ſteel; is harder than jaſper; not cut with ſteel. Fracture ſomewhat plain, dull. Pecten impalpable. Poliſh perfectly jaſpidean, ſhining, the concretions excepted.

Fig. Amorphous.

Struct. Of the ſubſtramen indeterminate.

Qual. Colour red, inclining to purple, black, green. Subſtramen ſubdiaphanous, or tranſmits a very little light at the edges.

Chemical Characters.

The ſubſtramen is untouched by acids, even when invigorated by heat. Is more eaſily fuſed in the fire than jaſper itſelf. Forms an opaque, compact glaſs; *Waller*. It remains, however, entire in a fire, in which jaſper is fuſible; *Pott*. Vitreſcible, its glaſs ſcoriform, dark.

Note

Note [O.] SLATE, STEGANIUM, p. 204.

STEGANIUM.

Fiſſilis menſalis, *Auctor.* Schiſtus cœruleſcens, durus, clangoſus ex Scotia, *Gronov.* Ind. p. 10. n. 10. Schiſtus purpureus, *Da Coſta*, p. 175. Schiſtus cœruleus, *Da Coſta*, p. 181. Saxum fiſſile cœruleum, *Sibbald. Auctor.* p. 35.

Britiſh Slate. Table Slate.

Natural Characters.

Sit. Primitive. Strata vertical, fiſſile.

Subst. Homogeneous, earthy, ſchiſtoſe.

Consist. Tranſmits no light, cuts with a knife. Longitudinal fracture plain; tranſverſe rude, angular. Writes white. Poliſh very ſlight, dull.

Fig. Amorphous.

Struct. Indeterminate. Pecten impalpable.

Parts. Fragments of the ſtrata quadrangular, rhomboidal, fiſſile, parallel; the ſides being plain, ſmooth, even.

Qual. Blue, black, purple. Rings when ſtruck.

Chemical Characters.

Impervious to water. Fuſible; paſſing into a ſcoria that floats in water, and even in ſpirit of wine. Urged by a ſtronger heat, it paſſes into a more denſe ſcoria. *Waller.*

Compoſition. Silica, magneſia, lime, iron; with a ſmall portion of mineral oil. *Kirwan.*

Note

Note [P.] ARDESIA, p. 204.

[Though I ſaw no Ardeſia in Arran, I ſhall take the liberty of ſubjoining Dr Walker's deſcription of it, that the reader may ſee in what particulars it differs from ſlate, to which it is very nearly allied. There are inexhauſtible quarries of Ardeſia at Eiſdale, Balahuliſh, and other parts of the Weſtern Highlands. Slate generally riſes in broader plates than Ardeſia. In Cornwall and Wales, there is much ſlate; but I never heard of Ardeſia in theſe places. The beſt ſlate is equal in durability to the beſt Ardeſia, though the former is ſubject to greater variations in quality than the latter.]

ARDESIA.

Ardeſia tegularis, *Waller*, I. p. 337. Schiſtus Ardeſia, *Linn.* Greeniſh, gloſſy, talky ſlate, *Woodward.* Foſs. Part I. p. 18. n. 80. Schiſtus viridis, *Da Costa*, p. 182. Schiſtus ſprinkled with yellow pyrites from Scotland, *Gronov.* Ind. p. 10. n. 11.

Scottiſh: Skailzie.

Natural Characters.

Sit. Primitive. Strata vertical, fiſſile.
Subst. Homogeneous, earthy.

Consist. Tranſmits no light; cuts with a knife. The longitudinal fracture plain; the tranſverſe rude, angular.

Fig. Amorphous.

Struct. Determinate. Pecten palpable. Surface of the plates undulated, furrowed, ſtriated, or punctured; faintly ſhines.

Parts. Fragments of the ſtrata quadrangular, rhombic, large.

Qual. Blue, greeniſh, black. Rings when ſtruck.

Chemical Characters.

Impervious to water. Is not decompoſed by the weather.

Obs. It contains cubical, yellow, cryſtals of iron pyrites, ſcattered at a diſtance from each other.

GENERAL REMARKS.

I. *On the* GRANITE MOUNTAINS, TOPAZES, &c.

THE granite mountains of Arran occupy an area of from eight to ten miles from north-eaſt to ſouth-weſt, and from five to ſix miles in the oppoſite direction. Their ſouthern baſe exceeds ſix miles in length; but the northern ſide does not much exceed three. We ſhall aſſume their area to be a parallelogram, of eight miles by five, which gives forty ſquare miles occupied by the granite mountains. Were actual meaſurement applied, I doubt not but theſe mountains would be found to occupy a larger area than that here aſſigned.

The different varieties of granite have been deſcribed as they occurred. With regard to the veins of granite mentioned by Mr Playfair, (Illuſtrations of the Huttonian Theory, p. 314.), as penetrating the ſchiſtus, I ſaw no ſuch veins, nor any veins of granite but ſuch as I have deſcribed, interſecting the granite mountains themſelves. Nor did the granite of ſuch veins, except in its mode of arrangement, and the ſuperior ſize of its maſſes, ſeem to differ in ſtructure from the granite contiguous to them. The only exception to this obſervation, are the two very curious veins of granite

granite included in the vein of whinſtone, in the channel of Roſa Burn, deſcribed p. 54. At the junction of the granite with the ſchiſtus in the mountain of Tornidneon, no regular vein of granite was ſeen in the ſchiſtus; though many detached maſſes of granite were found in the ſchiſtus, and ſome detached pieces of the latter in the former. Though I often looked for the veins deſcribed by Mr Playfair, I ſaw none; but I ſuſpect I had not been fortunate enough to ſtumble on the places where he found them.

It has been obſerved, that veins of talk, by ſome called mica, occur in theſe mountains; and that ſilicious cryſtals, of various degrees of perfection, from the firſt rude approach towards a regular form, to the perfect topaz, are found diſſeminated in blotches, or veins of quartz.

But ſilicious cryſtals, generally of a ſmoky colour, and five-ſided, terminating in pyramids at both ends, are often found in the body of the granite itſelf. The ſize of theſe has always a reference to the ſize of the cryſtals of fellſpar, with which they are connected; the largeſt being found in thoſe parts of the granite where the fellſpars are largeſt.

The largeſt and moſt perfect of theſe cryſtals are found in what the people here call *rotten rock*; and theſe are always of a ſmoky colour. This rotten rock is an incruſtation of thoſe large cryſtals

ſtals of fellſpar, which have improperly acquired the name of adularia *(flattering.)* Though many of the adularia remain entire, a conſiderable proportion of them has mouldered down into an earthy maſs, of a yellowiſh colour, and a ſlight adheſion, which has occaſioned the name affixed by the people to this incruſtation. Theſe incruſtations are found adhering to the cheeks of veins, or rents, in the granite mountains, or inveſting hollow cavities in the granite rocks. Though the cryſtals are placed in every poſſible direction, and croſs each other at various angles, they have always their broadeſt apex more or leſs projected from the cruſtaceous baſe in which they are inſerted. Their general figure is pentagonal, terminating in pentagonal pyramids, their ſides tranſverſely ſulcated, the pyramids ſmooth; but not unfrequently two or more cryſtals are indented into each other, which occaſions a greater number, and irregularity in the breadth of the ſides. It alſo occaſions an irregularity in the ſhape of the pyramid; and not ſeldom a tendency towards two or more pyramids in the ſame cryſtal. In ſuch caſes, ſmall black flakes, and a fibrous appearance, reſembling a moſſy vegetation, are often viſible in the centre of the pyramid. Theſe incruſtations are eaſily ſeparable from the ſolid rock to which they adhere, and are always moulded by its ſhape; which clearly ſhews that they are adventitious, and

that

that they have been formed in theſe ſituations by infiltration, or by ſlow depoſition from ſome menſtruum. We can form ſome idea of this from the formation of incruſtations, and of ſpar of lime, in cracks, and caverns of rocks, which are unqueſtionably produced by infiltration; as we ſee them, in many places, in the very act of formation. The coalpits of Swinridgemoor in Ayrſhire, afford another illuſtration, where incruſtations of ſilicious cryſtals are actually forming, or formed, upon the till-roof of the old waſtes. That diſtrict abounds with ſtrata of ſilicious ſandſtone, ſimilar to the French burr-ſtone; and theſe ſtrata contain many petrifactions of wood, converted into flint, though the bark is converted into a coaly bitumen. The wood could not have been ſo completely changed, without the infiltration of the ſilicious matter into its pores; and the cryſtals in the old waſtes muſt be formed from ſilicious matter, conveyed by aqueous ſolution, and either depoſited in the form of a ſplintery cruſt, or ſhooting into pyramidal cryſtals. No ſuch cryſtals are found in thoſe places from which the coal has been recently extracted.

What ſeems to prove that the adularia had been formed from the decompoſition and ſubſequent cryſtallization of the felſpar in the granite rocks, and the topazes from the ſilicious matter in the ſame rocks, is, that theſe two ſpecies of cryſtals

ſtals uniformly bear a relative proportion to each other in point of ſize. When the adularia are of large ſize, the topazes are alſo large; and when the one is ſmall, the other is alſo ſmall; and in the laſt caſe, neither of them are ſo regular as in the firſt. This ſeems to indicate the different degrees of ſlowneſs, and freedom from perturbation, by which they had been formed. It is well known that the ſize and regularity of cryſtals are much affected by theſe cauſes. Where the adularia remain entire in theſe incruſtations, they are always of a white colour, and ſeem to affect the rhomboidal figure. Perhaps the earthy matter of the cruſt may be fellſpar depoſited without cryſtallization. Both ſpecies of cryſtals ſeem to have been formed at the ſame time, and to have been ſeparated from the ſame liquid.

Theſe ſmoky topazes abound in Cairngorum as well as in Arran. Heating them carefully in a ſand-bath, is ſaid to convey to them the bright yellow colour of the oriental topaz. Hence ſome have ſuppoſed their ſwarthy colour to be owing to carbon in the body of the ſtone, which the heat deſtroys. I am rather diſpoſed to impute their dark hue to oxyd of iron, which the heat, in ſome degree, deoxydates or changes, ſo as to make it tranſmit and reflect a different colour. To the ſame cauſe, and not to carbon, I am diſpoſed to impute the dark colour of pitchſtone.

For

For my ingenious friend Dr Thomſon having heated ſpecimens of it in a furnace, with acceſs of air, with a view to burn off the carbon which is ſuppoſed to convey its colour, found its ſurface and cracks in ſome caſes acquired a yellowiſh brown, or ruſty colour, evidently from an alteration of the ſtate of oxyd of iron; while the interior parts of the ſtone remained unchanged. A ruſty incruſtation is often ſeen to cover the pitchſtone of Arran, and to penetrate its cracks, acquired by expoſure to the air alone; becauſe the interior parts are a bottle green, of various intenſity.

The concluſion ſeems therefore warranted, that the topazes, as well as the pitchſtone, of Arran, owe their colour to iron in their compoſition, in a particular ſtate of combination with oxygen.

We already adverted to the vaſt maſſes of granite which are found among the mountains, or on the ſea-ſhore contiguous to the granite mountains. Similar maſſes are found along the ſummits of the ſecondary mountains, towards the ſouth, and around the ſea-ſhores not only of Arran, but of Holy Iſland. But I remarked of theſe maſſes, in general, that the further they are removed from the granite mountains, the ſmaller they are in ſize, and the more rounded they are in ſhape. Some blocks on the ſhore at South-End are globular. It is evident that theſe blocks muſt have come into their preſent poſition, before the waters had ſcooped

ed out thoſe deep ravines, which now ſeparate the granite mountains from each other, and inſulate the whole group of theſe mountains from the other mountains in Arran. Theſe facts lead back our thoughts to a very remote period, when the iſland was, perhaps, much more extenſive than it is now; when the granite mountains were much more elevated, and the iſland ſloped from them in all directions; when ſtreams of water diverged from them, as from a centre, and rolled theſe blocks, in all directions, towards the extremities of the iſland.

On Cairn-table, the mountains of Gleſpin, and others between Muirkirk and the vicinity of Lead-hills, rounded blocks of granite, and of ſyenite, are found, and in the channels of the waters which interſect them, though no rocks of theſe materials are found there. But theſe blocks muſt have come from mountains of theſe materials, at a remote period, when the ſurface ſloped, and ſtreams of water flowed, from the granite towards theſe ſecondary mountains. Similar examples might be adduced from other places, though theſe ſeem ſufficient to illuſtrate the opinion here advanced.

Granite is probably the oldeſt rock now in exiſtence, and its formation ſeems to have preceded that of animals and vegetables; becauſe no organized remains are found in it. But the facts which

which occurred in Glen Roſa, and others which might be adduced, ſeem to prove that other rocks preceded its exiſtence. Perhaps Dr Walker makes too many primitive mountains; and, in place of the word primitive, I am diſpoſed to ſubſtitute the word primary; indicating, that ſome rocks are older than others, but that none are primitive in an abſolute and unconditional ſenſe.

II. *On* Micaceous Schistus, *or* Lepidotes.

These mountains have been deſcribed as inveſting the granite all round, and forming a ſort of elevated terrace projected from their ſides. On the weſt and north they are extended to a much greater diſtance than on the eaſt and ſouth-eaſt. Oppoſite to thoſe tremenduous chaſms, or corrys, which are excavated in the granite mountains on the eaſt, the barrier of ſchiſtic rock, as far as viſible, is generally very thin, in ſome places only a few feet over. Hence I have ventured to aſcribe theſe excavations to the lateral preſſure of great maſſes of water, confined within the granite, when the mountains were much higher than they are now, which had burſt its barriers, and carried out the ſides of the mountain.

The Huttonians regard granite 'as a ſtone of 'more recent formation than the ſtrata incumbent 'on

'on it; as a ſubſtance which has been melted by 'heat, and which, when forced up from the mi-'neral regions, has elevated the ſtrata at the ſame 'time.' (Illuſtration, &c. p. 84.)

By the ſtrata incumbent on granite, they muſt mean micaceous ſchiſtus, for I never ſaw any other ſtrata come in contact with granite but thoſe of this genus. I obſerved many places where the granite comes in contact with the ſchiſtus, in Arran; but their line of junction is concealed by ſoil and herbage, or by looſe blocks of ſtone. On the north ſide of Tornidneon, and on the ſouth ſide of Glen Catacol, their junction is diſtinctly ſeen, in perpendicular rocks of great elevation. The firſt I have attempted to deſcribe; and the ſecond, as far as my opportunity of obſerving enabled me to form an opinion, ſeemed ſtill more effectually to exclude the idea of the one rock reſting on the other. The further the ſchiſtus was removed from the granite, the more its ſtrata were inclined towards it; but near the junction, they were abſolutely perpendicular, or, by ſtrange contortions, bent backwards, as if afraid to face the granite. But in Catacol, as far as I could obſerve through exceſſive rain, and the glimmer of twilight, the line of junction ſeemed a perpendicular ſection from the top to the bottom of the mountain.

Mr Playfair's mathematical abilities are certainly of the firſt eminence; and, with the moſt humble deference to that talent in which all acknowledge his great ſtrength lieth, I cannot help regreting to ſee him making ſuch large encroachments upon his mathematics, in order to make his fire, or heat, or whatever he pleaſes to call it, operate exactly in the way his theory requires it to act, and in no other.

That *action* and *reaction* are equal and contrary, I conceive to be a law of nature, or rather a law impoſed upon matter by the Being who created it. If there be a great expanſive power exiſting in the centre of the earth, whether produced by heat, or any other cauſe, its reaction muſt be equal on all points of the ſolid cruſt with which it is environed. If, then, by any ſudden increaſe of this expanſive power, from cauſes which Mr Playfair has not choſen to explain, the expanſion ſhould take into its head to burſt its barriers, and to ſpew out granite mountains, whinſtone or metallic veins, or any other product that might ſuit its fancy; were its operations not wholly directed by whim and caprice, we might expect it would pay ſome deference to the known laws of nature, and make its greateſt eruptions where the reſiſtance was leaſt. Hence we might expect to ſee granite mountains bolting more frequently through ſandſtone and other ſtrata, than through micaceous ſchiſtus.

A ſolid maſs of micaceous ſchiſtus, from its toughneſs and tenacity, is certainly calculated to give much more reſiſtance to a force acting from below, than any other ſtrata with which I am acquainted. It is more brittle at the quartz with which it is interſperſed; but by hypotheſis, theſe quartz were projected into it by the ſame heat which elevated the granite. That it was a ſolid body, and not a pulpy maſs, when this wonderful elevation took place, appears from the hypotheſis; becauſe, on the latter ſuppoſition, they cannot account for the ſtrange fractures, diſlocations, and irregularities of the ſchiſtic ſtrata.

But ſuppoſing this rock only to oppoſe an equal, or even a leſs, reſiſtance, to the expanſive force of heat, than other rocks: as the cruſt which compreſſes their expanſion, muſt be of very various thickneſs and preſſure, I really wiſh our theoriſts would explain their *taliſman*, their *arcanum magnum*, by which they contrive to make the expanſive power of liquid granite to react againſt this rock alone, and againſt no other. Theſe are myſteries which, to my weak capacity, ſeem incomprehenſible. I have looked for explanations of them, but have found none.

There are others, which, in my apprehenſion, even darken darkneſs. In Arran, whence came theſe veins of porphyry, of whinſtone, of pitchſtone, of pitchſtone porphyry, which interſect the

granite mountains to their ſummits, and are generally more regular than ſimilar veins in the lower parts of the iſland? Our theoriſts ſay they were belched up by the expanſive power of heat. This muſt have happened either at the ſame time that the granite was elevated, in a liquid maſs, or after the granite had conſolidated into mountains.

If theſe ſubſtances were elevated in a liquid form, along with the granite, they muſt have been completely intermixed; and I do not ſee any power, ſhort of a miracle, which could have ſeparated them, and arranged the granite in ſtrata, and the others in veins, ſo diſtinctly marked and diſcriminated from the granite.

If the ſubſtances which fill theſe veins, erupted after the granite had cooled into ſolid rock, I do not ſee by what caprice they perſiſted in forcing their way to the ſummit, againſt ſuch tremendous reſiſtance, when they might ſo eaſily have avoided ſuch an unequal conflict, by forcing a retreat through the ſides of the mountains. By the laws of fluids, their forcing a paſſage to the ſummit, againſt ſolid rocks, or even in open vacuities, where they had little or no lateral reſiſtance, is utterly impoſſible.

Here, again, ſome taliſmanic influence muſt be employed to direct the expanſive force of the matter which fills theſe veins, againſt granite, while its neighbour, the micaceous ſchiſtus, is ſpared.

In

In Arran, the ſchiſtic rocks are interſected by whinſtone veins, more ſimilar to thoſe I had been accuſtomed to obſerve, than many others which interſect the ſtrata in other parts of the iſland. But neither here, nor any where elſe, did I obſerve either pitchſtone, or porphyry, to interſect the ſchiſtus, though they interſect the granite, and the ſandſtone.

Another difficulty occurs. Our theoriſts aſſert, that thoſe blotches, and columnar ſtrata of baſalt, which abound in Arran, and which reſt either on indurated ſtratified clay, or ſandſtone, had been belched up from below, and ſpread, in a liquid form, on the ſtrata which they cover. Certainly, if the baſaltic materials which now occupy the veins in the ſchiſtic rocks, and, ſtill more, thoſe in the granite, had been belched from below, they would more naturally have eſcaped by the ſides, than have aſcended to the ſummits, of theſe mountains. Had this been the caſe, we might have flattered ourſelves with ſeeing colonnades, or at leaſt blotches, of baſaltic rock, reſting on the ſides, or in hollows, of ſchiſtic and of granite mountains. Such things may be; though I never ſaw them, or even the ſlighteſt ſymptom of them. In Lewis, indeed, I ſaw baſaltic veins, running in micaceous ſchiſtus, which had aſſumed, in ſome parts, the columnar form. But ſuch columns did not riſe above the ſurface, and were not perceived,

except where ſtreams of water had formed excavations in the vein, and the ſchiſtus formed a wall on each ſide of the columns.

But it is time to attempt a retreat from the difficulties which environ the igneous theory, and to enter upon a further expoſition of facts.

Slate always forms veins, or compartments, in the ſchiſtic mountains, and ſeems only to differ from them in the greater regularity of its laminæ, and in containing a ſmaller proportion of quartz, and of mica. It ſeems pretty certain that the ſlate and the micaceous ſchiſtus were formed at the ſame time, and by the ſame proceſs of nature. I have ſeen examples, though not in Arran, of vegetable impreſſions, and very diſtinct ones of ſkeletons of fiſhes, in ſlate. Though ſuch occurrences are very rare, I flatter myſelf they warrant a concluſion,—that the ſchiſtic mountains have been formed at a much later period than thoſe of granite, and that the formation of the former was poſterior to the exiſtence of plants and fiſhes, though it ſeems to have preceded the great multiplication of theſe organized bodies.

With regard to the mode by which theſe rocks were formed, I conceive their formation would firſt commence upon the granite; that the quartz, which I would rather chooſe to call ſilicious ſpar, would firſt ſeparate from the liquid, and form tabular

bular maſſes, on which the ſchiſtus would depoſit; or nuclei round which its laminæ would ramify.

The ſchiſtic rocks have been formed, partly from cryſtallization, partly from depoſition, though the cryſtallization is not ſo perfect as that of granite, nor the depoſition ſo regular as that of other ſtrata. With regard to ſlate, it ſeems to have been formed wholly from depoſition; and its ſtrata are always regular, except when maſſes, or veins, of ſilicious ſpar occur; and theſe, to a certain extent, occaſion the ſame irregularities in its ſtructure, which they produce in the ſchiſtic rocks, of which they are a part.

III. *On the* BRECCIA *or* PUDDINGSTONE, SANDSTONE, &c.

I HAVE diſtinguiſhed two varieties of this ſtone, the firſt of which I have called primary, the other ſecondary.

The firſt lies next to the ſchiſtic rocks, though it does not encloſe them all round, as theſe do the granite. It forms a chain of detached hills, running parallel to the ſchiſtic rocks, from the head of Glencloy to the mouth of the Iorſa. From this a branch runs down through the centre of the ſouth hills, and the ſtrata riſe towards it all round, as they do towards the ſchiſtic rocks in other places.

In ſome places detached maſſes of it occur; and a vein, or irregular blotch of it, was deſcribed, occupying a chaſm in the granite above Currie. This is the moſt ſingular circumſtance that occurred reſpecting the poſition of this rock; for, in all other caſes, it was placed beyond the ſchiſtic rocks.

It is difficult to penetrate this rock, ſo as to obſerve its internal conſtruction. But, eaſt from Arran caſtle, large fragments of it had been blaſted, in order to clear the land. I obſerved that its ground, or ſubſtramen, was ſchiſtic earth, of a bluiſh grey colour, or concreted granitic ſand, generally white, but ſometimes a little ruſty. Often theſe two ſpecies of ground formed irregular, and parallel layers, in the ſame ſtone.

The concretions, or ſtones, included in this rock, are of all ſizes, and ſome are very large. They are generally angular, or not much rounded. Thoſe I obſerved are, granites, micaceous ſchiſtus, ſilicious ſpar, whinſtone. Large round blocks of ſilicious ſpar often occur, ſimilar to thoſe which abound in the ſchiſtic rocks.

As theſe rocks are compoſed of fragments of the granite and ſchiſtic mountains, their formation ſeems to have been next in order to that of the latter; and they were probably formed when the ſea waſhed the ſides of the granite mountains.

The ſecondary, or ſtratified puddingſtone, is much more various in its ſtructure. Its beds are of

of various, and ſome of enormous thickneſs. As it often alternates with red ſandſtone, it muſt be regarded as of the ſame formation with the ſandſtone. In ſuch caſes, its beds often do not exceed a foot in thickneſs.

The ground of this ſtone is generally an arenaceous ferruginous clay, of various, but commonly of great hardneſs. Near Laggantwine, and other places, the ground is indurated chalk.

Its concretions, or the ſtones it includes, are ſometimes large, but generally of ſmall ſize, and very much rounded. Theſe are round jaſpers; ſilicious ſpar, commonly ferruginous, but often white; granite; micaceous ſchiſtus. In many caſes rounded flints occur, which are white to the heart like chalk; though ſometimes the flints are blackiſh, or brown, in the heart. In many caſes agates, calcedonies, and various ſtones which are uſually poliſhed for ornament, are frequent. Nodules of pitchſtone alſo occur, eſpecially towards the ſouth end. Rounded and angular fragments of ſyenite are frequent in theſe rocks; for which Mr Jamieſon accounts, as he found this rock *in ſitu*. Pieces of ſlate, and laminæ of ſandſtone, are frequent in theſe rocks, from Laggan to Laggantwine; and in moſt of them, rounded fragments of red, and frequently of white ſandſtone, often occur.

Where

Where maſſes of this ſtone have fallen aſunder, the fracture frequently, though not always, interſects the concretions.

At a place between Currie and Arran Caſtle, where they were quarrying ſtones for building, a ſtratum of puddingſtone was interpoſed between two ſtrata of red ſandſtone. The ſandſtone below was very little marked by the rounded pebbles of the puddingſtone; while the ſtratum above, when removed, exhibited round holes, or cells, correſponding to the projecting pebbles of the puddingſtone. In a few other caſes, where alternate ſtrata of pudding and ſandſtone were ſeen in ſection, the lower ſurface of the puddingſtone exhibited vacuities between its pebbles, ſhewing that they did not much impreſs the ſandſtone; while the ſandſtone ſtratum above, filled up every interſtice between the pebbles. Though it would be raſh to draw general concluſions from a few individual facts, yet it appears that, in theſe caſes at leaſt, the ſtrata had not all been conſolidated at once, by a ſudden increaſe of ſubterraneous heat, but that they had been conſolidated ſucceſſively, in the order in which they had been ſpread over each other; the one below being hardened into rock, before the one above it had been ſpread upon its ſurface.

A circumſtance is viſible at the Scriden rocks, and other maſſy ſtrata of puddingſtone, which I had

had formerly ſeen exemplified in the mountain of Morven in Caithneſs, which is compoſed moſtly of coarſe puddingſtone. This is large rounded blocks of puddingſtone, compoſed of ſmaller rounded pieces, which are alſo a concretion of rounded pieces. Sometimes the larger block includes a ſmaller block, and this a third, all compoſed of rounded ſtones. We have thus puddingſtone of the firſt, ſecond, and third formations.

This clearly ſhews that the ſecondary ſtrata have undergone at leaſt three revolutions, before they were arranged in their preſent form.

The ſtrata of pudding and ſandſtone have always two inclinations, one from the primary mountains, which is their line of bearing, or outcrop; the other at right angles to this; and the line of dip is the diagonal between theſe lines. North from Sannox the ſecondary ſtrata have more or leſs of a northern dip, with a few exceptions; and all ſouth from this, dip more or leſs towards the ſouth. The ſtrata contiguous to the primary mountains are ſometimes perpendicular, and always form a higher angle with the horizon than thoſe more remote. Were they of equal thickneſs throughout, it is evident that this would cauſe angular ſpaces to be left unoccupied. But there are ſome opportunities of ſeeing that they thicken as they deſcend.

Mr Playfair denies the poſſibility of parallel ſtrata of puddingſtone or ſandſtone being formed

on

on a ſurface of great inclination; becauſe water could not arrange the materials in a parallel form, in ſuch a poſition. Without entering into any diſpute concerning the cauſe that produced the elevation of thoſe ſtrata that now form a very high angle with the horizon, and which, apparently, had not been formed in their preſent poſition; I ſhall only ſtate, that I have ſeen banks of ſand and gravel arranged in regular parallel ſtrata, which formed conſiderable angles with the horizon. Often in ſuch ſtrata are troubles ſeen to occur, ſimilar to thoſe in ſandſtone ſtrata; and ſometimes even ſlips or ſhifts take place, where the corre-ſponding ſtrata are elevated, or depreſſed, though the alternate beds ſtill continue to be regular. I ſhall only ſpecify one example, becauſe it affords a lively repreſentation of the ſtrata in Arran, though the ſtrata do not form ſo high an angle as thoſe near the primitive mountains. It is a bank of gravel and ſand near the mill, about a mile north from the church of Kilfinnan, in Cowal, Argyleſhire. This is a bank of ſand and gravel, which has been laid open by taking materials to form the road. It conſiſts of gravel and fine red ſand, arranged in alternate ſtrata, which are perfectly regular and parallel, and which dip towards the north at an angle of about 30°. Theſe ſtrata have acquired a ſmall degree of conſolidation; and they prove that ſtrata may be formed by water,

ter, not only perfectly regular and parallel, but even placed in an angular position. Like the ſtrata of gravel in this bank, the puddingſtone ſtrata of Arran always alternate with red or brown, but never with white ſandſtone. Where groups of white and red ſtrata occur, I ſaw no puddingſtone.

Next to the primary puddingſtone, I am diſpoſed to place, in the order of formation, the ſtratified pudding, red ſandſtone, and thoſe ſtrata of the white ſandſtone which often alternate with the red. In theſe ſtrata I never could trace the ſmalleſt veſtige of animal or vegetable impreſſions. But ſuch might have been depoſited among the materials, though afterwards obliterated by the ſucceſſive eroſions and recombinations to which they have been ſubjected.

Next in order I would place the white, grey, yellow, blue, and other ſandſtone ſtrata which uſually cover coal; together with the coal itſelf, blaes, bituminated ironſtone, and all the ſtrata uſually denominated coal metals. Theſe muſt have been formed after the earth's ſurface had been amply clothed with woods, and after large accumulations of moſſes had vegetated. There is every reaſon to believe that peat-moſs and wood are the chief materials from which coal was formed. Wood, and what has the appearance of compreſſed moſs, is often found in coal. The ſtrata which cover it are uſually diſſeminated with petrified wood;

wood; and the blaes, which is only coal with too great a proportion of earth in its compoſition, often contains not only numerous marine plants and ſhells, but alſo various impreſſions of land vegetables.

Reaſons were already aſſigned for eſteeming the blind-coal in Arran of a different formation from the bituminated coal of other places. No vegetable remains were ſeen in the ſandſtone which covers it, or in any ſandſtone of Arran. Whether they exiſt in the bituminated blaes connected with the coal, or in thoſe which crop out along the coaſt, could only be aſcertained by digging into them, which time would not permit.

IV. *On* Ironstone. Potters' Clay.

The hæmatites and kidney ironſtone were probably formed at the ſame time with the ſtrata of red clay ſchiſtus and ſhiver, in which they are diſſeminated, and the ſtrata of red ſandſtone in which they are encloſed.

Theſe materials ſeem utterly inexhauſtible, and they are ſituated directly oppoſite to the ſpacious harbour now conſtructing at Ardroſſan, on the coaſt of Ayrſhire. When this harbour is connected with Paiſley and Glaſgow by a canal, an extenſive iron-work will probably be eſtabliſhed ſomewhere

where near Dalry, which will command the carbonated ironſtone that abounds in the whole tract of the canal, and have eaſy acceſs to the ſtores in Arran, in order to produce a favourable mixture of ſtones of different qualities.

The two ſtreams of North and South Sannox may eaſily be converted into one, and produce waterfals of great altitude and power. At Sannox, Currie, and many places along the coaſt of Arran, natural wood abounds; and, were it properly managed, it might yield abundance of charcoal for making bar-iron and ſteel.

Strata of white indurated clay were ſtated to abound along the north-eaſt coaſt of Arran. I tried a ſpecimen, which was very far from being the beſt, but was within reach of conveyance. Though I had no means of pulverizing and managing it properly, it baked into ſtone of a white colour.

Even the red clays near the Cock ſeem capable of making uſeful and ornamental ſtone-ware.

V. *On* PITCHSTONE.

IT is hardly neceſſary to add any thing to what was ſaid of this foſſil, as it occurred during the ſurvey. It is found only in the granite mountains, or in the ſtrata of red ſandſtone. In the firſt ſituation,

ation, it always forms veins; in the laſt, it generally forms ſtrata, though it ſometimes alſo forms veins.

The body of this ſtone is the ſame with quartz, or ſilicious ſpar; and ſpecimens of it were deſcribed, ſouth from Clachland Point, which exhibited conſiderable round ſpots of quartz, of a pure white colour, amidſt the uſual dark green colour of the pitchſtone.

The experiments of my ingenious friend Dr Thomſon, already referred to, ſeem to prove, that pitchſtone owes its colour to oxyd of iron in a particular ſtate; or that ſtate of iron which conveys its peculiar colour to bottle-glaſs.

On the mountains ſouth from Muirkirk, which are moſtly compoſed of amygdaloid and red ſandſtone, I found fragments of pitchſtone; but the rocks being moſtly covered with ſoil, it was not ſeen *in ſitu*. This is only mentioned to ſhew that there is ſome apparent connexion between this foſſil and red ſandſtone.

VI. *On* BASALT, PORPHYRY, &c.

THESE I take to be the lateſt formed rocks in Arran; but as this may be deemed a hardy aſſertion by ſome, it may be neceſſary to enter more minutely into the reaſons on which it is founded.

Thoſe

Thoſe ranges of baſaltic columns, which I have called columnar ſtrata, which were ſeen to reſt upon ſtrata of ſandſtone, muſt have been depoſited after the ſandſtone ſtrata were formed; and the ſtrata of baſalt, which are interpoſed between ſtrata of ſandſtone and clay ſhiver, point out a gradual progreſs both in the depoſition and conſolidation of theſe ſtrata. They convince me, that the conſolidation of the ſtrata was not effected at once, by the ſudden action of heat; but as they were gradually depoſited, one after another, they were conſolidated in the ſame order.

The igneous theoriſts inſiſt that the baſaltic ſtrata were forced up through the veins, in a liquid form, and afterwards ſpread upon the ſurface, where, by ſlow cooling, they cryſtallized into columns; and that the baſaltic ſtrata, which are interpoſed between other ſtrata, had been injected into them from the ſame veins.

I can underſtand a liquid to be injected into cracks, or vacuities of a ſolid body; but that it ſhould be ſpread into a ſtratum, of ſuch regularity and extent as many of theſe ſtrata in Arran, appears to me utterly impoſſible. For example, the regular baſaltic ſtratum which forms the caſcade of Eſcoom, never could have been projected into its preſent poſition, againſt the preſſure of an incumbent maſs of ſtrata, of ſeveral hundred feet perpendicular. By ſuch means, a blotch, or irre-

gular maſs, might have been formed; but not a regular horizontal ſtratum, of equal thickneſs, through a great extent.

Unfortunately, too, the veins which aſcend to this ſtratum, and the one at Eſſiemore, are of an entirely different character from the baſalt which covers their mouths. They are a ſort of baſaltic breccia, conſiſting of hard, angular, or rounded fragments, immerſed in a ſoft matter; while the baſaltic ſtrata are hard and uniform in their ſtructure. Such veins could not have been raiſed, in a liquid form, from the bowels of the earth, or they would have been equally homogeneous in their ſtructure with the baſaltic ſtrata. Theſe veins ſeem therefore to have been rents in the ſtrata, which had been filled with fragments and mud, waſhed in from the ſurface, before the baſaltic ſtrata were depoſited above them. After the formation of theſe ſtrata, other ſtrata of clay and ſandſtone have been formed above them; and, laſtly, thoſe columnar ranges which occupy the ſummits of theſe mountains. That theſe ranges were formed by depoſition, ſeems very probable; becauſe no veins were ſeen to extend to them. The veins all terminated at the lower baſaltic ſtratum, which, at Eſcoom, is ſeveral hundred feet below their baſe.

But the rounded fragments of granite, ſandſtone, &c. found in the veins below Dunfioun, demonſtrate,

demonſtrate, that the baſalt in theſe veins was not ejected, in a liquid form, from the bowels of the earth. We cannot ſuppoſe rounded ſtones to exiſt in the bowels of the earth, unleſs there be ſeas and rivers there to round them by attrition. The rounded maſſes of blue baſalt, and the nodules of pitchſtone, &c. often found in veins of grey baſalt, alſo prove that theſe had never been ſubjected to igneous fuſion, unleſs we can ſuppoſe this heat to be influenced by mathematical rules, and to ſpare one body, while it melts another of equal or leſs fuſibility.

In other caſes, the veins are ſeen to interſect the ſtrata, and the baſalt which reſts upon them, to their ſummits. But theſe veins are never ſeen to communicate, or mix with the baſalt; which muſt have happened, had the latter been ejected from the former; but the baſalt in the veins is invariably of a different colour and texture from that in the ſtrata.

At the Struey rocks, one baſaltic vein deciſively terminates before it reaches the bottom of the rock; and near King's Cove, veins of pitchſtone are ſeen to terminate at a much ſmaller depth. In Clachlan Burn, ſimilar veins are ſeen to terminate at no great depth, being intercepted by indurated clay. It is evident, therefore, that the matter of theſe veins had not been ejected from below, but had been waſhed in from above. But it

is needleſs to recapitulate all the facts already ſtated, as the concluſions that ſeem to reſult from them are generally pointed out as they occur.

By way of illuſtration, it may be proper to travel a little out of the record, and to adduce a fact or two from the oppoſite extremity of Scotland.

Caithneſs, and the South Iſles of Orkney, are chiefly compoſed of red, white, and a greyiſh-blue calcareous ſandſtone. No baſalt of any kind is ſeen, and the veins are filled with calcareous ſpar, or with angular fragments of the ſtratified rock, which are generally, though not always, cemented by ſpar, and ſometimes with ponderous ſpar. At Gerſtone, a little way above the bridge of Halkirk in Caithneſs, there is a broad vein interſecting blue calcareous ſandſtone and limeſtone. It is filled with oval and globular pebbles, which are moſtly of the ſame ſpecies with the ſtrata which the vein interſects; though others are granite, ſyenite, quartz, and other ſtones; of which there are no rocks nearer than about fifteen miles. Theſe are all cemented together by means of ſpar of lime, cryſtallized in the vacuities. Will any man be hardy enough to aſſert, that theſe rounded pebbles were thrown up from the central region of the earth, by the expanſive force of heat; and that the ſpar which binds them was fuſed, while ſtones of much greater fuſibility than this ſpar, eſcaped fuſion? Or who will aſſert that the ſandſtone

veins,

veins, which often interſect the ſandſtone ſtrata in Arran, were ejected in this manner? or that the fragments of ſlate, which occupy a vein in North Sannox water, and other places in Arran, were thrown up in this manner? The aſſertion carries abſurdity on the face of it. Such veins could not have been filled but by materials waſhed in from the ſurface; and I apprehend, that what is predicable of one vein, may be ſafely predicated of the whole,—that they all received their materials from the ſurface.

This opinion is not the reſult of any prejudice againſt the igneous theory, or its admirers; for at one time I was as zealous a believer in this theory as even the moſt fiery of our philoſophers. Though a more attentive examination of geological phenomena had gradually cooled me down, I ſtill continued to regard baſalt as an undoubted product of heat. But in the Shiant Iſles, ſituated in the Minch, between Skye and Lewis, there is an iſland called *Garbhe* (rugged) compoſed of very lofty baſaltic columns, moſtly of five ſides. In a ſort of bay, on the north-weſt ſide of this iſland, the columns contain very numerous madrepores and muſcle-ſhells, of an uncommon ſize, and perfect form. The ſhells are not even broken; and the muſcles, ſo far from being injured by the heat which is ſuppoſed to have melted the baſalt, retain the blue colour, on their external ſur-

faces, as freſh as if they had but lately been taken from the ſea. Theſe iſlands, and the neighbouring ſeas, alſo exhibit maſſy towers, and colonnades of columns, regularly articulated, and every way as perfect as thoſe of Staffa, or the Giant's Cauſeway. Whether the latter alſo contain ſhells, I had no opportunity of examining. Theſe facts convinced me that baſalt had originally been a muddy depoſite, which conſolidated and ſplit into columns, by ſlow drying, and not by ſlow cooling.

But I am far from denying the action of heat, where its effects are viſible. In Skye there are very extenſive rocks, of a ſort of coarſe breccia, including many fragments of wood, where the ſtones are partially vitrified; and the ſand, which fills up their interſtices, is cemented by means of a vitreous matter injected among it.

Sir Iſaac Newton lays down an excellent rule of philoſophizing,—that no more cauſes ſhould be admitted than what are true, and are ſufficient to account for the phenomena. So far is this central heat from being proved to exiſt, that the moſt authentic experiments demonſtrate, that the deeper we deſcend into the earth, the more its heat diminiſhes. But granting the exiſtence of this heat, which is merely a gratuitous ſuppoſition, it will not account for the facts I have attempted to deſcribe. I have ſtated nothing but what I ſaw; and

and the phenomena are as open to every one's obſervation as to mine.

If theſe geological phenomena cannot be accounted for by the igneous theory, but rather ſtand in direct oppoſition to that theory, the queſtion again recurs,—In what way may they be accounted for?

It is ſufficient to ſhew that they could not be produced in the way aſſigned, though we may not be able to condeſcend upon a conſiſtent mode by which they were effected.

We know that volcanoes exiſt; and though their effects are admitted to be very partial, yet they were probably much more numerous in ancient, than in modern times. Unqueſtionable traces of their effects have been pointed out in the iſland of Skye; and it is probable that the pabulum of volcanoes is, in numerous caſes, wholly exhauſted, and, in thoſe which ſtill exiſt, very much diminiſhed.

We know that earthquakes ſtill exiſt, and continue to operate very ſtriking effects upon the ſtrata of the earth. Though we do not know the cauſe which produces theſe alarming concuſſions, it is very probable that the cauſe was endowed with much more energy during the infant ſtate of the world, than at preſent.

It appears more rational to aſcribe the elevation and diſlocation of the ſtrata to cauſes which we

know to have a real exiſtence, than to a cauſe whoſe exiſtence is merely hypothetical, and whoſe operation is flatly contradicted by the phenomena.

The ſlighteſt inſpection of the material ſyſtem forcibly impreſſes on the mind, a belief, that the whole originated from a Being, intelligent and beneficent. Whether the Firſt Cauſe willed matter to obey certain laws, and left all its ſubſequent motions and combinations to be effected by the operation of theſe laws; or whether every motion and combination of matter be the reſult of his conſtant and immediate energy, it becomes not us to inquire; nor is the ſolution of this queſtion of any importance.

However unfaſhionable, and even unphiloſophical, it may appear to have recourſe to the Bible, for any aſſiſtance in geological inquiries, I cannot help flattering myſelf that the account which Moſes gives of the conſtruction of our globe, is, with one poſtulatum, more conſiſtent with phenomena, than any other that has yet been advanced.

The poſtulatum is, that what he calls days, are not meant to ſignify days according to our acceptation of the word, but periods, of a very long, but uncertain duration. This opinion has been maintained by Divines of the higheſt eminence; and even thoſe who underſtand the word in its common acceptation, muſt allow, on their own principles,

principles, that the conſtruction of the world, or bringing it into the ſtate in which we now ſee it, was not inſtantaneous, but progreſſive.

The firſt chapter of Geneſis begins with a general aſſertion, that the material ſyſtem, or the 'heaven and the earth,' derived its exiſtence from God.

What follows is merely a detail of the different changes and arrangements that took place in the matter of which our globe is compoſed, as they would have appeared to a ſpectator placed on the earth's ſurface, after it aſſumed a ſurface on which a ſpectator could reſt.

The firſt ſtate is that of chaos,—'the earth was 'without form and void.'—This expreſſion would lead us to conclude, that the matter of which our globe is compoſed, even that which now conſtitutes the moſt ſolid rocks, was originally in a ſtate of gas, or elaſtic fluid. Independent of any thing that Moſes has ſaid, there are ſtrong reaſons for adopting this opinion, which further improvements in chemiſtry are likely to confirm. Though the formation of ſolid bodies, by gaſeous combinations, cannot be ſo frequent now as in the infant ſtate of the world, when moſt of its materials were probably gaſes, we ſeem ſtill to have an exemplification of this proceſs in the formation of meteoric ſtones.

How

How long this period continued, we cannot determine: but it appears that, in its progreſs, a great body of water was formed, perhaps by the combination of hydrogen and oxygen, and that this formed the moſt denſe part of the earth, from its centre upwards. From the combinations and precipitations going on in the maſs of vapours which ſurrounded the aqueous fluid, they ſeem to have been impervious to light. Theſe vapours were alſo agitated by a mighty wind, which would produce a colliſion among the particles, and favour their combinations. It is alſo probable that, long before the termination of this period, the aqueous maſs would be amply ſtored with earthy particles; and that even great depoſitions of theſe would have taken place, forming a denſe nucleus, of ſtratified matter, around the earth's centre.

The ſecond period is when the maſs of vapours were ſo far depurated, that the rays of light could penetrate, exhibiting a ſort of twilight; ſo that a ſpectator, on the aqueous ſurface of the earth, would imagine that light then began to exiſt. In the progreſs of this period, a limpid expanſe of air is ſeparated from the general maſs, called the firmament, having the aqueous ſurface of the earth below, and cloudy vapours in the higher regions. It is probable the other proceſſes were ſtill going on, and that large accumulations of earthy depoſite continued to be ſeparated from the aqueous fluid.

The

The third period is that in which the elevation of the ſtrata took place, and the dry land was formed. I have already hinted the probability of this being produced by ſome ſuch cauſes as now occaſion earthquakes. Theſe ſeem to derive their origin from chemical proceſſes in the bowels of the earth, which let looſe immenſe quantities of elaſtic fluids, having their elaſticity, perhaps, ſuddenly increaſed by the ſhifting of the electric fluid. Theſe cauſes would operate much more powerfully in the infant ſtate of the world, when matter was only in a progreſs towards forming permanent combinations; and when the ſtrata which reſiſted the eſcape of theſe vapours, had not attained their preſent hardneſs and ſolidity: while the waters would ſink into the receſſes left by the upthrown ſtrata.

The cloſe of this period is diſtinguiſhed by the production of graſs, and the various tribes of plants.

In the fourth period, the atmoſphere was ſo far purged from aqueous, and other vapours, that not only an intercepted light could penetrate to the earth's ſurface, but the direct rays of the ſun, moon and ſtars, could reach it; ſo that a ſpectator on the earth's ſurface, would imagine that theſe luminaries then began to exiſt.

The fifth period is diſtinguiſhed by the formation of fiſhes and fowls; and then, alſo, we may ſuppoſe

ſuppoſe that thoſe ſtrata which exhibit the exuviæ of plants and of marine animals, were formed.

In the ſixth period quadrupeds, and terreſtrial animals were formed; and, towards its cloſe, man, to exerciſe dominion over them.

This I take to be the ſubſtance of the doctrine of Moſes concerning the coſmogony, or formation of the earth: and it is all one whether we ſuppoſe the Supreme Being impreſſed certain laws of attraction and gravitation upon matter, and left it to paſs through its ſeveral changes, in obedience to theſe laws; or that each ſucceſſive change was effected by a repetition of his volition. Moſes repreſents him as interpoſing at each ſucceſſive change; and new acts of his volition ſeem abſolutely neceſſary when plants and living creatures were formed. But in the preceding caſes no more ſeems neceſſary, than a continuation of his original volition. Indeed, I cannot conceive the laws of nature, or the mode by which matter operates on matter, to be any thing elſe but the will of God, who, had it been conſiſtent with his wiſdom and goodneſs, might have cauſed matter to obey laws very different from thoſe by which it is now regulated.

How long theſe periods, or days of creation, continued, we have no means of determining. They were ſteps in the operations of a Being, whoſe works, ſo far as we have opportunity of contemplating them, are progreſſive; and with whom

whom a thouſand years are as one day, and one day as a thouſand years. But it is probable the primary ſtrata underwent ſeveral ſucceſſive revolutions of decompoſition, and recompoſition, before the exiſtence of plants or animals; and that the ſecondary ſtrata, which contain impreſſions and exuviæ of theſe, alſo underwent ſeveral revolutions.

Indications have been pointed at, which ſeem to ſhew that certain rocks preceded granite, though granite ſeems to have preceded organized bodies: and the facts deſcribed, reſpecting breccia, ſeem to indicate, that the ſandſtone ſtrata had, in ſome caſes at leaſt, undergone three revolutions.

It was an opinion of the late Dr Walker, that the whole claſs of inflammables, derived their peculiar properties from the action of the ſun's rays. It is now generally underſtood that coal, and other inflammable foſſils, have been formed from vegetable and animal matters. Volcanoes are ſuppoſed to be cauſed by pyrites, water, and coal. Hence the ſtrata from which they erupt muſt have been formed long after the exiſtence of vegetables and animals. I am hence inclined to think there were no volcanoes in the primeval world; though there might be numerous and violent concuſſions, ſimilar in kind, though much more extenſive in effect, than modern earthquakes.

The

The late worthy Mr David Ure, in his hiſtory of Kilbride and Rutherglen, and others, have brought to light many curious facts reſpecting the remains of animals and vegetables found in the ſecondary ſtrata of the earth. Among other diſcoveries, they found plants, and animal remains, which no where exiſt, in a living ſtate, except between the tropics. Does not this ſeem to indicate, that the poles of the earth were once in the equator?—or that the earth may have a very ſlow motion from north to ſouth, as well as a rapid motion from weſt to eaſt?

One remarkable circumſtance deſerves attention,—that no bones of quadrupeds, or of men, have yet been found in the ſolid ſtrata of the earth. This ſhews they are of late origin, and will bring down their creation to the period ſpecified in the ſacred writings.

It is not long, indeed, ſince a contrary opinion was current among our philoſophers; and the bones in the rock of Gibraltar, along the ſhores of the Adriatic, and in many rocky iſlands in the Mediterranean, were alleged, even by ſkilful anatomiſts, to have moſtly belonged to the human ſpecies. Theſe rocks were repreſented as having formerly been the cemeteries of the human kind. A worthy nobleman, who pretended to no ſkill in anatomy, ſuggeſted a very pertinent queſtion on that occaſion,—whether any of the peculiar bones

of

of the human head, which diſtinguiſh the human from other ſkeletons, were to be found among this immenſe maſs of bones? On reconſideration, though many bones of the heads of other animals, ſuch as jaws, teeth, ſkulls, &c. were found, not one that diſtinguiſhes the human ſpecies could be ſeen. It was all one;—ſome philoſophers had pronounced theſe to be human bones, and the people to whom the bones belonged might have contrived to live without heads, or might have depoſited their heads in ſome ſituation apart from their other bones. It ſeems now to be agreed on all hands, that theſe bones did not even belong to terreſtrial animals; but were the excluſive property of thoſe inhabiting the ſea.

Since man and quadrupeds, therefore, began to inhabit the earth, it does not appear that any very extenſive formation of new ſtrata has taken place; though partial formations are often ſeen, by the concretion of cementing matter among the interſtices of ſand and gravel. Of this we have ſome ſtriking examples on the banks of the Tweed below Melroſe, and many other places. The principal changes have been the wearing down of the mountains by ſtreams of water, and the extenſion of vallies from their *debris*. The ſea ſeems alſo to have encroached in ſeveral places, and to have thrown up ſand-banks, which are gradually cloathed with ſoil, in others. There is alſo reaſon to be-

lieve

lieve, that the ſea has cut through the ſofter parts of the ſtrata, in many places, ſo as to ſeparate lands that were formerly united. Of this we have an example in the disjunction of this iſland from the Continent by the Straits of Dover; and a ſtill more ſtriking example in the ſeparation of the Orkney iſlands from Caithneſs, and of theſe iſlands from each other. But in this laſt period, the greateſt changes in the ſuperficial ſtrata ſeem to have been produced by volcanoes. The original elevation of the ſtrata was aſcribed to ſome ſuch cauſes as now produce earthquakes; and the changes effected by volcanoes, are not, like the former, univerſal; but local and partial.

The view I have here given of my ideas, or rather thoſe of Moſes, concerning the formation or arrangement of the ſtrata of the earth, is not, I flatter myſelf, contradicted by any known fact in geology. But I admit that we are yet children in our knowledge of this ſubject; and that a ſufficient number of facts are not collected, to enable us to form a rational or conſiſtent theory.

AGRI-

AGRICULTURE.

In this iſland we behold the firſt rude efforts of man towards the cultivation of the earth. It will not, therefore, be neceſſary to enter very minutely into this branch of the ſubject; and it may be ſufficient to deſcribe the modes now adopted, with the changes that are neceſſary, in order to promote improvement.

Arable Surface.

This bears a very ſmall proportion to the extent of the iſland, which being moſtly occupied by lofty mountains, does not exhibit a great proportion capable of aration. But the extent actually cultivated is very ſmall, when compared with the extent which might be profitably ſubjected to the plough.

The late Mr Burrel eſtimated the cultivated land of Arran, on the Duke's property, at 10,067 acres, and within the head dikes 15,770 acres of paſture land, moſtly capable of cultivation. I am inclined to think his eſtimate, in both caſes, but eſpecially in the latter, very far ſhort of the actual extent.

The valued rent, in the county books, is 5,048l. 17s. 8d. Scots; and the groſs rent of the iſland, at preſent, is 5,500l. Sterling. The net rent, after defraying public burdens, is rather under 5,000l. *per annum*. Suppoſing the other properties to contain 300 arable acres; theſe, added to thoſe belonging to the Duke, will make 10,367 cultivated acres in the whole iſland, and the rent of each acre very little more than ten ſhillings. Thus, the immenſe extent of hill and mountain paſture may be conſidered as yielding nothing to the proprietors; while the arable land, which we have ſaid is calculated conſiderably within its extent, hardly yields them more than ten ſhillings *per* acre.

Small as this rent is for ſuch an extenſive iſland, it is believed that part of it is extracted from other ſources than the produce of the land; and that, according to the preſent ſyſtem of management, the people could not bear an additional riſe. This will be more eaſily underſtood, when we come to explain the particulars. But were this iſland only put into a tolerable train of improvement, the rent might be raiſed to fifteen or twenty thouſand pounds *per annum*, or even more; and the people ſtill be enabled to enjoy the comforts of wealth and independence.

STATE

State of Property.

This iſland was originally a royal domain. It was then moſtly clothed with wood; and being ſtocked by red deer, roes, wild boars, and other animals of chaſe, was much reſorted to by our Kings, for the purpoſes of hunting. The firſt creation of private property upon it, ſeems to have been in favour of a ſmall nunnery eſtabliſhed on the iſland of Lamlaſh, which had the iſland, and ſome lands around the bay, annexed for its ſupport. The monaſtery of Kilwinning afterwards obtained a grant of the lands between Currie and Loch Ranſa; and the convent of Saddle in Kintyre, enjoyed thoſe of Schiſkin, and others, on the weſt ſide of the iſland. At the diſſolution of monaſteries, theſe lands accrued to the family of Hamilton as chieftains of the iſland.

At preſent, the Duke poſſeſſes by far the greateſt proportion of the iſland. The Marquis of Bute has three farms, thoſe of Eaſt and Weſt Corry-gills, and Kildonan. The executors of the late Duke have nine farms, moſtly intermixed with the farms which are entailed upon the dukedom. The family of Fullarton have two farms, thoſe of Glencloy and Whitefarlan, which are the beſt managed in the iſland. This may be partly owing to the waſte land having been divided, ſo that the

tenants can venture to deviate from the uſual ſyſtem of the iſland. This family is deſcended from one MacLewis, of French extraction, who obtained a charter of their lands from Robert Bruce, dated Arnele, Nov. 26. in the ſecond year of his reign, from gratitude for the ſervices MacLewis afforded the King while he ſkulked in Arran. Several others obtained grants of land for ſervices rendered to Bruce in Arran; but their properties are now abſorbed by the family of Hamilton. The lands belonging to the Duke are all entailed; but with no limitation in the power of granting leaſes ſhort of a hundred years; which is the longeſt leaſe admiſſible by the law of Scotland. It has long been the practice on this property, to grant leaſes for nineteen years; which would anſwer very well, were the arrangements to be ſuggeſted, adopted. The other properties are unentailed.

The firſt and moſt obvious defect in the ſtate of property, is, the mountains and waſte lands being common to each proprietor, with the exception of Captain Fullarton, ſo that each has an unlimited right of killing game, and of putting live ſtock upon the waſte lands, independent of the extent of his property. Unleſs the waſte lands be divided, and each proprietor or his tenants be compelled to keep his live ſtock within his own territories, improvement is impoſſible.

But

But the evils which reſult from this mixed ſpecies of property, are nothing, when compared with thoſe which reſult from the confuſed mode by which the land is poſſeſſed by the tenants.

Mode of Occupancy.

The cultivated land is occupied in run-rig, or in narrow ſtripes, called butts, with intervals betwixt them, whoſe poſſeſſors are changed every ſecond or third year. Each farm conſtitutes a *ſocietas arandi*, or townſhip, where a number of families, ſometimes to the extent of from fifteen to twenty, are concerned in its cultivation, who divide the different ridges or butts among them, either according to old uſage, or according to certain regulations agreed on among themſelves; and if there be a butt or ridge remaining after the diviſion, it is ſubdivided by marks of ſtone, or ſticks, into parcels correſponding to the intereſt each family has in the whole farm. A ridge, or patch, is frequently ſeen with fifteen to twenty diviſions of this ſort marked upon it. All are jointly and ſeverally liable for the rent; and it is eaſy to ſee, that this mode of diviſion, and the proportion of rent which each ought to pay, muſt give riſe to frequent diſputes.

Between the arable land and the riſe of the hills, there is a greater or leſſer extent of waſte land allotted to each farm, on which the milk cows of all the ſeveral tenants, who occupy the farm, are paſtured under the inſpection of a common herd. This appropriated tract of paſture is ſeparated from the common waſte, by a ruinous fence of turf, called the head-dike.

All the reſt of the iſland, beyond the head-dikes, is common; and when the crop is removed, the whole iſland is common to all the live ſtock upon it.

The mountains, and common paſture of the iſland, are ſtocked, or rather overſtocked, by the yeld cows, by ſheep and horſes, which all paſture promiſcuouſly, without any inſpection or care of a ſhepherd. Every one endeavours to drive his animals as far as he can from his own corn; and if they ſhould commit attacks upon that of his neighbours, he leaves them to take care of themſelves. As every one has an unlimited right of putting as many ſheep, or cattle, upon the mountains as he pleaſes, every one endeavours to put as many there as his capital or credit may enable him to procure; and there are frequent examples of perſons who pay only a few ſhillings of rent, having more numerous flocks upon the mountains, than others who pay above 40l. The conſequence is what might be expected. The graſs of theſe mountains

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is torn up even by the roots. You never ſee a cow, or a ſheep, lye down to ruminate. They are perpetually active, and ſeem to hold a very unequal conteſt with ſtarvation. The poor animals barely exiſt during ſummer. In winter many die; and the ſeaſon is commonly far advanced before the ſurvivors are able to travel in queſt of food.

It is evident, that with this mixed and confuſed mode of occupancy, there can be no draining, no encloſing, no ſown graſſes, or green crops. Let a man have ever ſo much capital or ſkill, they would be of no avail to him,—becauſe it would be madneſs in him to deviate from the common routine; and if a man, by great economy, ſhould ſave a little money from his farm, he has no inducement to lay it out in the melioration of the land, but muſt put it out to intereſt, or veſt it in ſome mercantile ſpeculation. Hence this ſyſtem has an irreſiſtible tendency to drive the capital from the land on which it was produced; while every enlightened landlord, and ſound ſtateſman, ſhould unite in promoting the tendency of capital towards the improvement of land.

The firſt and moſt obvious ſtep towards improvement, therefore, is not only the diviſion of the waſte land among the ſeveral proprietors, but alſo the judicious allotment of the cultivateable land into ſeparate farms, of extent ſuited to the capital and ſkill of each occupant. Without this, the

iſland muſt remain for ever in its preſent unproductive ſtate, and improvement will continue to be impracticable.

Farm-Offices.

These are commonly arranged in ſmall irregular villages, generally near the extremity of the farm, where it would ſeem cultivation had firſt commenced. There is generally a large extent of paſture ground contiguous to them, called a loaning, where the cattle are collected, and by which they are conducted beyond the corn-fields. The houſes are built by the farmers themſelves, of ſtone, and wrought clay in place of cement. They have cupples built in the walls, with croſs ſpars, over which is laid bruſhwood, or cabres, to ſupport the roof. They are ſometimes thatched with ſtraw; but more frequently with heather; and the roof has a net-work of heather ropes thrown over it, on which ſtones are ſuſpended at the eaves, to prevent it from being blown away by the wind. The dwellinghouſe always conſiſts of two apartments. The larger, or kitchen, has a ſkreen of wrought clay and ſtraw, ſupported upon upright poles, between the outer-door and the fire-place, and an inner-door to exclude the cold air. The fuel is commonly peats; and the fire-place is compoſed of flat

ſtones

ſtones ſunk in the floor near the end of the houſe; but ſo ſituated that people can go all round. The ſmoke eſcapes by an aperture in the roof, which has an elevation like a bee-hive, lined with clay, to cauſe a draught. A chain, attached to a croſs beam, ſerves the purpoſe of ſuſpending pots, and other utenſils; while an inſtrument, called a ſwey, raiſes and ſets down larger boilers.

The interior chamber is ſometimes divided from the kitchen, by means of wooden beds, between which there is a paſſage, and a door of ſeparation. Sometimes it is divided by a clay ſkreen, which is whitewaſhed on the inſide. In this the fire-place is commonly placed, on a flat ſtone, between jambs, and the ſmoke is conducted through a chimney built in the wall. In many caſes the chamber is paved with flag-ſtones; in others it has attained the luxury of a deal floor, and is covered with a deal floor above, while the walls are plaſtered, or whitewaſhed. The kitchen has always one window, commonly of ſquare boards, ſet in a frame, and rarely of glaſs panes. The chamber has generally, though not always, a glaſs window, of larger ſize than that in the kitchen; becauſe here, no light is admitted except through the window.

I nowhere ſaw in Arran an abſurdity which is frequent in many parts of the Highlands, viz. the cows lodged in the ſame apartment with the people. But it often happens that the cow-houſe is entered

entered by a door from behind the hallan, or ſkreen between the fire-place and outer-door; though the animals never paſs this way, having another door by which they come in, and go out of, their apartment.

The other offices are a ſtable, where the horſes are commonly driven in promiſcuouſly, and frequently ſtand to the knees in mire; a ſmall barn, in which a little rick of corn may be ſtowed and thraſhed; a ſhed for holding carts, cars, and other implements; and ſometimes a ſhed for holding peats. Every farm has at leaſt one kiln upon it; becauſe, here, the corn is not dried at the mill where it is ground, but at the farm where it is produced. Theſe kilns are generally of very awkward conſtruction; ſometimes not covered from the rain except by blankets ſupported on poles. The corn is laid upon ſtraw, ſpread upon croſs poles ſituated a little below the mouth of the inverted cone, which is the figure of the kiln. The fuel is a fire of peats, or bruſhwood, in the mouth of a ſmall aperture which conducts into the bottom of the kiln. Often the flame ſets fire to the ſtraw, and corn incumbent on it; and it always happens that the corn is irregularly dried, and a quantity of it eſcapes through the ſtraw, and is loſt.

Each tenant in the ſociety has a ſuite of theſe buildings, though the kiln is often common to the village.

village. They are all conſtructed and repaired by the people themſelves; which occupies much valuable time during ſummer; and they are arranged without order or ſymmetry.

Were the land divided into ſeparate farms, it would be proper to have commodious farm-offices built in the centre of each farm. The iſland abounds in ſlates, and clays adapted for making excellent tiles. Theſe, in the end, would be found the cheapeſt of all roofs; and their uſe would ſuperſede the neceſſity of deſtroying much valuable land, by cutting turf for covering houſes, or faſtening the thatch.

Implements of Husbandry.

These are moſtly made and repaired by the farmers themſelves; and the improvident deſtruction of the woods which formerly abounded in this iſland, is now the ſource of great hardſhips to the people. In order to get a few ſticks for a plough, or a car, &c. four men muſt ſet off in a boat to Ayr or Argyleſhire, when they hear that woods are cutting. There they are often detained a whole fortnight, and expend much more than the value of their ſticks, beſide their loſs of time.

Their

Their implements are,

1. A very awkward and clumſy Scotch plough, of the old conſtruction, drawn by four horſes, yoked two and two, with a driver. Generally a man or two follows the plough, to reduce inequalities by the ſpade. I did not ſee the *calscrom*, or ploughing ſpade, which ſtill continues in many parts of the Highlands, in any part of Arran.

2. A light harrow, of three bills, and ſhort iron teeth, drawn, in pairs, by a horſe to each. Theſe harrows require to go very often over the ground before they cover the ſeed; ſo that where the land is ſtiff, or cloddy, which frequently happens, harrowing is a much more tedious operation than ploughing. They only ſcratch the ſurface; never penetrating the land ſo as to tear up the root-weeds.

3. Iron ſpades of the uſual conſtruction. They have alſo a wooden ſpade, which is peculiar to the Highlands. It is an angular piece of wood, ſhod with three or four inches of iron at its point, and having a long handle on its right ſide, dreſſed from the ſame piece of wood. The angle projected from the handle, towards the left, ſerves for preſſing it down with the foot. For digging in ſtony ground, and other kinds of work, this ſpade anſwers better than thoſe in general uſe. The people uſe it, in place of a hand-hoe, for planting, cleaning, and digging their potatoes.

They

They alſo frequently uſe it for cutting peats; though they have a much longer and narrower ſpade, of the ſame conſtruction, for that purpoſe.

4. Cars, or ſledges. Theſe conſiſt of two beams, or trams, joined together by croſs-bars, or rungs. The horſe is yoked into them the ſame way as into a cart; and the only difference is, that the cars want wheels, but ſlide upon the ground at the hind end of the trams. They are uſed for carrying out dung, which is put in creels or baſkets, faſtened to the cars; or for bringing home peats and corn; in which caſes, the cars are commonly furniſhed with a back of ſticks.

At South-End, and other places where there is level ground, or the ſlighteſt mockery of roads, the people uſe ſmall carts, of very elegant conſtruction, which they import from Ayrſhire; a proof that they are willing to adopt the moſt approved practices, were they put into a ſituation to render it poſſible.

All carriages, except through the farm, or to boats in its vicinity, are performed on horſes' backs; becauſe there are interruptions between one diſtrict of the iſland and another, which are not ſurmountable even by cars.

It is not intended to enter into a detail of all the implements uſed in this iſland, but only to point out ſuch as are peculiar to this, and other

parts

parts of the Highlands. None of the improved implements, and few of the improved practices, of other places, have yet reached this iſland.

Live Stock. Horses.

The original breed was very ſmall; becauſe, if a mare got a foal in the moors, ſhe was allowed to rear it there, without aſſiſtance. Of late, breeding has much declined; and horſes of a larger ſize are imported from Argyleſhire, ſometimes to croſs with the natives, but more frequently for the purpoſes of labour. The late Duke endeavoured to improve the breed of this iſland, by importing ſtallions; by horſe-races, and other premiums;—juſt as a predeceſſor of his eſtabliſhed the Lanarkſhire breed of horſes, which, for labour, is unqeſtionably the beſt breed in the world. Thoſe imported from Argyleſhire, ſeem to have ſome of the Iſle of Mull blood in them, derived from horſes reſcued from the wreck of the Spaniſh Armada. The original breed of Arran ſeems to have been derived from the ſame ſtock, and poſſeſſes all their good qualities, though under a diminutive form.

Such of theſe animals as are accuſtomed to the ſaddle, are docile and tractable in an extraordinary degree; patient of fatigue; endure hunger; and gratefully take any kind of food that is offered them.

them. Their ſureneſs of foot is moſt remarkable. They will ſcamper with you over looſe fragments of rock, and down ſteep declivities covered by the ſame. In theſe caſes, the judgment with which they chooſe their ſteps, and lift their feet over the larger blocks, is truly aſtoniſhing. In general, the ſlighteſt pull of the bridle will turn them any way you pleaſe. But there are caſes, where they know they are right, and you are wrong; and if they ſhould chooſe to walk along the very edge of an unfathomable precipice, it would be very dangerous to enter into a diſpute with them. The reſult of the diſpute would be, that the animal would take the road which it knew to be ſafeſt and beſt for itſelf; and your perſevering in the argument would only endanger your being both thrown over the precipice.

The average ſize of horſes here varies from about ten to fourteen hands high. Many of them are of ſize and ſtrength ſufficient to draw the two-horſe plough, eſpecially in ſuch friable ſoils as abound in Arran. Were the requiſites to be afterwards mentioned provided, and followed by judicious croſſing, a breed might be reared here for the ſaddle, ſuperior to any in the world.

Cows.

Cows.

THE cows here are generally of ſmall ſize, and do not ſeem capable of feeding beyond fifteen ſtone. Some may feed much higher, when properly cared for in early life; which is not the caſe in general. I was told, though I cannot verify the fact, that they ſeldom produce calves until they are four or five years old. This may naturally be expected from the ſtarving regimen to which they are ſubjected from early life upwards.

They are moſtly thin on the back, ſmall in the fore quarter, big, and looſe-bellied, and every way ill-ſhaped. Their colour is either black or brown, never ſpotted; which ſeems to be an effect of more complete domeſtication. They ſeem to be a confuſed jumble of various breeds; ſome of Iriſh extraction; ſome from Argyleſhire; ſome of the Galloway race, which are hornleſs. Owing to intermixture, ſome mongrels of this breed have a ſmall horn, not fixed to the ſkull, but attached to a cutaneous membrane on the left ſide of the head; and others a ſimilar, though ſmaller horn, ſimilarly attached to the right ſide.

Though this be the general character of the animals, many individuals exhibit all the points of a well-ſhaped cow, and afford a baſis on which ſkill and perſeverance might rear a very valuable breed.

breed. This cannot be done by introducing bulls of a large ſize from more improved diſtricts, which the Highland Society have encouraged by their premiums.

The way to improve the breed both of horſes and cows here, is, 1ſt, Aboliſh commons, and give every man a complete command of his ſtock, within his own premiſes. 2dly, Let abundant food be provided, in winter as well as ſummer. 3dly, Select the beſt of each ſex for breeding; and when food is abundant, judicious croſſing may be tried. But croſſing with a large bull or high-blooded ſtallion, animals which are turned out to a ſteril moor, where even the heath is ate to the bare ſtumps, is an abſurdity which could only enter into the brain of a madman.

The milk-cows have been deſcribed as herded within the head dikes. They get very little food beyond what they can pick up in that ſituation. The quantity of milk they yield is very ſmall; but very rich, and well-flavoured. The quantity cannot be aſcertained; becauſe the calves, confined before, are allowed to ſuck their mothers a ſhort time previous to the milking; and often the dairy-maid milks one ſide of the udder, while the calf is ſucking the other.

The people here make very little cheeſe, except ſome from ſkimmed milk, for their own uſe. But they make excellent butter, of a bright yel-

low colour, and fine flavour; which they cure with Iriſh ſalt, in a very ſuperior ſtyle.

Sheep.

These are a ſmall, hornleſs, white-faced breed, which were probably brought here by the Norwegians when they poſſeſſed the Hebrides. They feed to about four pounds per quarter; their mutton very ſweet, but weak and unſubſtantial. Their wool is very fine, but unequal in quality, and of ſmall quantity. Among them are ſeveral croſſes with the black-faced breed, the effect of which has been to convey a mixture of black and white to the face; with one, and ſometimes two, ſmall horns. Many of them are black, or brown, which are much eſteemed; becauſe, by ſcribbling their wool among the white, they make a ſort of mixed cloth, without dying. Moſt of the wool is wrought into cloth in the iſland, for the uſe of the natives.

The hardſhips theſe animals endure are incredible; and were proper means adopted to provide them with an abundant ſupply of food, in winter as well as in ſummer, it is poſſible a very valuable breed might be ſelected from them. But while all go promiſcuouſly; are hardly above ſtarvation in ſummer, and in winter and ſpring are reduced

duced to the laſt extremity; improving them is utterly impracticable.

Mr Crauford of Machry is the only tenant in the iſland who has got a hill and dale farm ſeparated from the maſs of common, and free of all intermixture. He has introduced a flock of black-faced ſheep, with a ſhepherd from Argyleſhire, which ſeem to thrive remarkably well. But as he underſtocks, and keeps good graſs, he is perpetually annoyed, by all the ſheep and cattle of the iſland intruding into his premiſes. Hence a great improvement cannot be effected here, unleſs it were the reſult of a general arrangement, comprehending the whole iſland. Mr Hamilton of Glenluig has introduced the black-faced breed under the diſadvantage of putting them upon a bare common, where they are intermixed with the other ſheep; while his arable land is run-rig, or intermixed among that of ſeveral other tenants. This ſhews the people here would adopt improvements, were thoſe ſteps taken on the part of the proprietors, which would render improvement practicable.

Each individual farmer has appropriate marks, by which he diſtinguiſhes his ſheep and other ſtock from thoſe of others. Towards the north, the ſheep are marked by hæmatites, called keel, in various parts of their bodies. In other places, by cutting their ears in various ways. In other pla-

ces, by thruſting thin ſlips of cloth, or thread, of various colours, through the external membrane of the ſkin, in various parts of the body of the animal. The cows are marked by clipping figures upon their hair; or by cutting their dewlap, from the throat downwards to the breaſt-bone, in a particular way. The marking of horſes has become leſs frequent, as breeding has diminiſhed. It is commonly done by clipping a particular mark in ſome part of the hair; but was formerly done by clapping a red-hot horſe-ſhoe on ſome part of the animal's body; which practice ſtill continues to a certain extent.

During winter, the cows and horſes are generally houſed at night, though not always. The former get a little fodder, the latter ſeldom. In other reſpects, the whole live-ſtock has no other ſource of ſubſiſtence but what they can gather in the fields, and along the ſea-ſhores. The quantity of fodder being very ſcanty, in proportion to the demand, the animals are reduced to mere ſkeletons towards ſpring; and, if the winter be unuſually ſevere, many die.

GAME.

AMONG the quadrupeds which come under this deſcription, the roes which formerly abounded, are now

now wholly extinct. So alſo are the wild boars, though a few tame ſwine are kept by the farmers. Theſe ſwine ſeem to be derived from the ancient wild boars, and are the ſame breed which prevails through all the Highlands. They are of ſmall ſize, ſhort ears, though longer than thoſe of the Chineſe breed, thin on the back, of a yellow colour, or variegated by rounded ſpots of black, and have briſtles. As no attention has ever been paid either to their feeding, or breeding, they ought not to be raſhly condemned. Perhaps ſkill and perſeverance may elicit a valuable breed from them. When tolerably fed, they make pork of the fineſt flavour.

The red deer, which was anciently the moſt conſpicuous quadruped on the iſland, are either wholly, or nearly, extirpated. This ſeems to have been occaſioned by the improvident deſtruction of the woods, which afforded them covert and ſhelter during winter. A few are ſaid ſtill to loiter amidſt the receſſes of the granite mountains; though I did not ſee any of them, when ſcrambling through thoſe terrific regions.

Wild goats formerly abounded in Arran; and though their extirpation has been encouraged, on account of the miſchief they did to plantations, a few are ſaid ſtill to exiſt among the mountains.

Hares abound in all parts of the iſland; and

rabbits among heaps of ſtones, or on ſandy downs near the ſea-ſhore.

No foxes, or other quadrupeds of prey, were ever ſeen in Arran; and it is to be hoped that none of our modern Nimrods will be ſo mad as to attempt their introduction.

Among the feathered tribes, the caperkailzie formerly abounded, but ſeems now to be extirpated. The black-cock and grouſe ſwarm in the moſt unbounded profuſion; and I ſuſpect their further multiplication is prevented, by not having a ſufficient proportion annually deſtroyed. Among theſe a few quails occur. On the granite mountains, the ptarmigan has choſen his reſidence. This bird ſeems to be the moſt extraordinary of any in exiſtence. He is ſo much in love with cold, that he never deſcends from his aërial regions, even when the mountains are clothed with ſnow. During winter he is ſaid to become as white as the ſnow. But I cannot conceive the poſſibility of an animal exiſting in ſuch a ſituation, where he can get nothing but ſnow on which to feed and repoſe; and is unfurniſhed with inſtruments by which he may dig throw the ſnow, ſo as to get at the herbage below. I am rather inclined to think, (notwithſtanding numerous teſtimonies to the contrary), that he muſt creep into a chink of the rocks, and there remain torpid, until the warmth of ſpring has diſſolved the ſnows.

Among

Among the wild birds are plovers of various ſpecies; ſtarlings; and others of ſmaller ſize, which ſeem to be migratory. A few partridges are found at South-End, and this bird can only propagate as cultivation increaſes.

The birds of prey are, eagles, kites, hawks of various ſpecies, and carrion-crows. The premiums given by the late Duke, for the preſervation of game, have nearly effected their extirpation.

Reptiles.

Serpents abound in Arran, and are thought to have multiplied ſince the birds of prey have been nearly extirpated. A ſpecies of hawk was deſcribed to me which preferred ſerpents to every other food. His method was, to ſeize the ſerpent by the tail, and carry him high in the air, ſwinging him ſo that he could not turn to bite; and, having dropped him upon a rock or ſtone, the ſerpent was ſo much ſtunned, that the hawk could deſcend and devour him in ſafety.

The ſerpents ſometimes kill ſheep, and convey to cows and horſes, and even to men, a temporary lameneſs. The largeſt I ſaw were about three feet in length; but was told that many of them exceed four. I obſerved three ſpecies, clearly diſtinguiſhed by their colour and ſpots; but as they

are known to caſt their ſkins, the people believe them to be all of one ſpecies, at different periods of their growth.

1. The common adder, or viper. It is of a dirty green colour, with a mixture of yellow, and dull purple ſtreaks, irregularly diſpoſed. It has a forked tongue.

2. Another ſpecies had a purple ſtripe running down its back from head to tail, from which purple ſtripes, forming meeting ſegments of circles, were projected on each ſide. Theſe lateral purple ſegments included ſpots of a pale golden yellow colour, exactly ſhaped like eyes; which were large or ſmall according to the breadth of the back, and were very regular and beautiful. The belly was flat, and azure blue. Obſerved no tongue; but its fang or ſting was of a black ebony colour, inſerted within its lower jaw, and which it could turn in various directions, and protrude by muſcular power. I ſuſpect this to be a different ſpecies from the firſt, becauſe I ſaw them of various ſizes, from about ſix inches to about three feet.

3. The third ſpecies was round in the body, of a dark gloſſy blue colour, ſmooth as ſatin, both on back and belly. The back was variegated by pale blue ſtreaks reſembling poliſhed ſilver, three of which formed parallel ſegments of circles which croſſed each other at the centre of the back,

and

and met towards the belly. Obſerved no tongue; but its fang was every way ſimilar to that of the former. This is by far the moſt beautiful of the ſerpent tribes I ever obſerved. Whether it be a diſtinct ſpecies, I ſhall not pretend to decide; for I only ſaw one about two feet ſix inches in length. Was told they often exceed four feet; but the people impute their dark blue colour to age, and not to difference of ſpecies.

A diſtinct ſpecies of ſerpent, which never attains a large ſize, was ſaid to neſtle among the looſe ſtones along the ſhores of Lamlaſh; but I did not ſee any of them.

Mr Pennant deſcribes a toad of enormous ſize, as a native of Arran. I was told that ſuch toads exiſt there, though I did not ſee any of them.

Course of Cropping.

Here no rotation, or general ſyſtem, prevails. The different hamlets, or *ſocietates arandi*, have rules and regulations peculiar to each hamlet; and they often depart from, and vary their rules, by mutual compact, which is a ſource of much diſpute among themſelves, and not ſeldom of expenſive litigation. Such communities are a juſt exemplification of the doctrine of liberty and equality, reduced to practice; where all are equal, it is true;

true; but it unfortunately happens, that all are equally poor. No man, be his talents and induſtry ever ſo great, can better his ſituation by profeſſional improvements: and he can only hope to ſave a little by penurious living, and removing what he can from the farm.

The cultivated land is divided into infield and outfield. Though it is impoſſible to condeſcend on particulars, it may be uſeful to point out the general outline of the treatment to which theſe ſeveral deſcriptions of land are ſubjected, or rather condemned.

We ſhall begin with the outfield, becauſe it is furtheſt from the village where the cultivators reſide.

The treatment of the outfield land is various, as muſt eaſily occur to any one who keeps in view, that it is ploughed in lots by a community, who vary their plans according to circumſtances. But it generally gets a little manure the firſt year it is broken up. It is then cropped with oats two years, or as long as it can double the ſeed; and is then left to gather graſs, or rather weeds, as it can; and is reſted two, or three, or more years. When manure cannot be procured, the outfield is allowed to remain untouched, until the tread, the browſing, and droppings of cattle have begun to ſubdue the weeds, and to coat the ſurface with a graſſy ſward.

ſward. It is then maſſacred as before; and no other crop but oats is ever put upon the outfield.

The infield land is always in crop, except when a deficiency of manure, and its inability to repeat the ſeed, compel a reſt. It is of no conſequence where we begin the general rotation; becauſe, as already obſerved, there is, in fact, neither ſyſtem, nor rotation. But we ſhall begin with,

1. Potatoes.—Theſe are either dibbled or planted by the hand, in ruts formed by the ſpade, forming rows acroſs the ridges previouſly ploughed. At South-End, and ſome other places, they have begun to plant them by the plough, which yields the largeſt and beſt produce. But as none of their ploughmen can draw a ſtraight drill, their drills diſcover ſtrange inequalities. Sometimes they get ſo cloſe that no plough can work between them: at others, there are broad ſpaces without any plants. In general, whether they plant by the hand or by the plough, the rows are too cloſe to each other, and the number of ſeeds in each row by far too great. The effect of this too great crowd of ſeeds can eaſily be underſtood, when it is ſtated, that the produce varies from fifteen to forty bolls *per* acre, as far as the eye can judge of acres, where there is no meaſurement. This is a very ſmall produce in a country whoſe ſoil and climate are ſo well adapted for that plant, that we might be tempted to reckon Arran the native country

country of the potato. Here, neither ſcab, nor curl, nor worm, nor other diſeaſe which is known to infeſt the potatoes of other diſtricts, were ever heard of. The potatoes here are uncommonly farinaceous, and of fine flavour. They always get manure of ſea-weeds, or of dung, or of compoſt of dung.

Thoſe planted by the hand are cleaned by the ſpade already deſcribed; while the weeds in the rows are pulled out by the hand. When the plants are in the act of ſpringing above ground, they are generally covered with a ſprinkling of earth from the furrows. The effect of this is to ſmother the weeds a ſhort time, and to afford opportunity to the potatoe plants of getting the ſtart of them. Thoſe planted by the plough, from the awkwardneſs of the operation, generally receive more aſſiſtance from hand, than from horſe-hoeing.

In moſt caſes, a man ſhifts his lot, or ridge, every year. But when he plants potatoes, with manure, he always keeps this lot two, and ſometimes three years.

2. Oats, or Bear.—If the latter, the land gets more manure. Average produce of bear, from three to four feeds.

3. Maſhlam, or Oats and Peas mixed.—Produce about two feeds. Sometimes peas, or peas and beans mixed, without any oats.

4.

4. If dung is wanting, or ſea-weeds, the land is reſted two years. But if theſe can be applied, bear is again ſown.

5. Peas are commonly ſown, chiefly for the ſtraw.

6. If the peas be tolerable, oats ſucceed.

7. Bear, again, with manure; or potatoes, as at firſt.

The bear land commonly gets one ploughing; is afterwards harrowed, and the manure ſpread equally over the ſurface. The bear is ſown upon the manure, and the ſeed covered by freſh earth, thrown from the furrows by the ſpade. In this way the bear ſtarts earlier than the weeds.

In other caſes the bear land gets two ploughings. The manure is covered down at the ſecond ploughing, and then the ſeed is harrowed in.

The time of ſowing is from the beginning of April to the end of May. The time of reaping is from the middle of September to the end of October. The reaping is moſtly performed by women, who underſtand that work well, and cut very cloſe and clean. But the crop is ſometimes ſo ſhort, that they are obliged to pull it up by the roots; and they always pull the bands for the ſheaves up by the roots. As they have no fanners, or wire ſieves in the iſland, this occaſions their bread to be much infeſted with earth and ſand.

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The corn is winnowed by being ſhaken before a current of air, between two oppoſite barn-doors. White oats have long ſuperſeded the grey and black oats, which ſtill prevail in moſt parts of the Highlands; and they frequently introduce a change of ſeed from Ayrſhire. But a very bad practice is too common, of reſerving what is called the tails, or lighteſt of their grain, for ſeed, while the plump, and well filled grain is converted into meal. This occaſions a much greater quantity of ſeed to be ſown, than would be otherwiſe neceſſary, together with the rapid degeneracy of the ſeed.

MILLS.

THERE are five corn-mills in Arran, all the property of the Duke, and the whole iſland is bound in thirlage to them. The mill-dues for different lands, vary from the ſixteenth to the tenth peck; and muſt be paid whether the corn be ground at them or not. This may be no great inconveniency while the iſland does not produce enough for its own conſumption; but, by impoſing a reſtraint on the commerce of corn, muſt operate as a great bar to improvement. Corn, with this tax upon it, cannot compete with corn that is free, when exported to a diſtant market. As the greateſt part of the lands aſtricted belong to the Duke himſelf,

himſelf, it would be eaſy for him to relieve his own tenants from this grievance; and leave the other proprietors to compound, or not, as they thought proper. As no more originally entered into contemplation, when theſe aſtrictions were eſtabliſhed, than the portion of grain which was conſumed by the people themſelves, it is not likely they will carry this portion from their mills, though the aſtriction were removed. Hence the mills will probably bring as high a rent after they are made free, as they do at preſent; and the tenants will have the advantage of getting their work much better executed.

The tenants are bound to repair the mill-dams, and to perform other ſervices neceſſary to keep the mill going; while the miller keeps up the machinery. The tenants perform all the work at the mill, in grinding their ſeveral parcels of corn. They winnow the ſhealing, or kernel of the grain, on blankets ſpread in the open air, at the great riſk of having it damaged by rain; and requiring an enormous expenditure of time. If fanners, with wire ſieves, or ſkreens, cannot be introduced into every farm, they ought, at leaſt, to perform this operation with more rapidity and ſafety, and to extract the particles of ſand and earth with which much of the grain of this iſland is contaminated, to be eſtabliſhed in every mill, and to be worked by the water-wheel.

HINTS

Hints of Improvements.

From the deſcription which has already been given of the actual ſtate of agriculture in this iſland, the improvements it admits of may eaſily be anticipated.

The *firſt* and moſt eſſential improvement is the abolition of common, by dividing the hills and mountains among the ſeveral proprietors. The *ſecond* is the allotment of the arable land into ſeparate farms, with a portion of the improveable waſte annexed to each, and building ſubſtantial farm-offices in the moſt commodious ſituations for each farm. The tenants ſhould be taken bound to bring into cultivation a certain extent of waſte land annually, by liming, or otherwiſe. *Third*, Encloſing and draining. In moſt caſes, encloſing by hedge and ditch will ſerve all the purpoſes of draining. Where the land is dry, ſtone walls may ſerve all the purpoſes of fences. In other caſes, concealed drains are neceſſary, for which there are every where abundance of ſtones. Inſtead of the preſent uſeleſs head-dikes, a ditch ſhould be run acroſs the declivity of the hills, at as high an elevation as it is poſſible ever to carry the plough. It ſhould be ſloped above, and faced with ſtone below, on the perpendicular ſide, to prevent the mound from being waſhed away. In ſome caſes,

it

it may be neceſſary to pave the bottom of the ditch with ſtones. This ſtone-facing ſhould be ſurmounted by a Galloway coping, ſufficient to exclude ſheep, or by ſtake and rice. The mound of earth thrown from the ditch ſhould be levelled, and be ſown with whins, or furze, in drills. This ſhrub thrives well in the iſland; and in this ſituation would ſerve the purpoſe of ſhelter and ornament, as well as of a fence. It would alſo prove an excellent reſource to ſheep when admitted within the fence during winter. Croſſing the declivity of the hills by a ditch, would alſo throw aſide the water which oozes down from above, and injures much good land lower ſituated.

The horſes and cows ſhould not be allowed to ſtray beyond the head-dikes; and even the ſpace within them ſhould be very lightly ſtocked.

Theſe things being put into a train of execution, the whole hills and mountains ſhould be lotted into ſheep-farms. This would prove a very eaſy operation, as they are divided by natural boundaries into portions of very various extent; viz. deep ravines, in which run ſtreams of water, and the ſhedding of the water at their ſummits. The cattle in the lower grounds ſhould be encloſed or herded; but, in the mountains, every flock of ſheep ſhould be under the care of a ſhepherd, and no encroachments permitted. It is needleſs

to repeat how much it behoves the mountains, as well as the vallies, to be lightly ſtocked. Grazing ground ſhould always have at leaſt a third leſs ſtock than it can eaſily maintain.

If farmers from a diſtance cannot be induced to embark in ſheep-farming on an extenſive ſcale, there are people on the iſland poſſeſſed of ſtock ſufficient for any undertaking of this ſort, were their hands unfettered, and left at liberty to act for their own and the general good. Should theſe not prove adequate to ſtock the whole mountains on a ſkilful ſyſtem of ſheep-farming, joint-ſtock ſheep farms ſhould be recurred to. This is done, by a number of ſmall tenants joining together, in order to ſtock a mountainous tract, for which the means of any individual are inadequate. Whether poſſeſſed by an individual, or by a company, ſheep thrive beſt when the extent allotted to a flock admits it to be divided into three hirſels, or flocks, each under its proper ſhepherd.

This joint-ſtock ſheep farming has already been reduced to practice by Mr Campbell, on a property in Lochaber. It was accompanied with a diviſion of the arable from run-rig, into ſeveralty; and its effects have proved highly beneficial. Inſtead of deſtroying aration or population, it has occaſioned a rapid extenſion of both. But the inconſiderate rage for ſheep-farming, which prevails among our Highland proprietors, has baniſh-

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ed aration and population from many extenſive tracts where they previouſly exiſted. Manage ſheep in ſuch a way, that their introduction, as a principal object, ſhall increaſe cultivation in the vallies, and places capable of culture, and ſheep will prove the ſource of increaſed population, and of proſperity to the Highlands.

In the glens where clay marl abounds, and along the ſea-banks and ſhores, ſweet graſſes grow with the utmoſt luxuriance. Such places ſhould therefore be reſerved for wintering the ſheep. Even the mountain paſtures admit of conſiderable improvement, by burning the heath; which has been too much diſcouraged, from the fooliſh notion of preſerving the game. Where the heath is burnt on a dry bottom, ferns ſpring up, with a cloſe pile of ſweet graſſes, and white clover below.

But it frequently happens that the paſture is injured through a long declivity, by water which trickles down from the higher grounds, and ſoaks and renders miry thoſe lower ſituated. Such water ſhould be intercepted by ruts drawn with the plough aſlant the line of its deſcent, and conducted into ſome natural diſcharge of water. The coarſe herbage may then be burnt; and in many caſes lime, or other manure, may be profitably ſpread upon the ſward, to improve the paſture. Towards the bottoms of the hills, it frequently

happens that ſprings erupt, and produce a ſort of ſhaking bogs, or round miry hillocks, very dangerous both for ſheep and cattle; while the water, ſpreading on the flat ſurface below, renders it miry. Such ſprings ſhould be taken off by a ditch led up to the fountain-head, which is bored at certain points. There are many caſes where the ſprings may be made to improve the herbage by watering. Were theſe ſuggeſtions carried into effect, the mountains would be rendered capable of ſuſtaining not only a much more numerous ſtock, but would alſo become very healthful for ſheep.

Much controverſy has ariſen reſpecting the comparative merits of the black-faced and improved Cheviots, as mountain breeds of ſheep. I apprehend the controverſy refers to local ſituation, rather than to the ſheep, veiwed in the abſtract. The Cheviot lambs, having no wool when they are dropped, are very delicate in infancy, and require ſheltered ſituations, and ſweet graſs, during that ſeaſon. But after they attain ſtrength, and a covering of wool, they become equally hardy as the black-faced breed. Their carcaſe is of equal, and their wool of far greater value than that of the latter.

The queſtion, then, as far as it relates to Arran, may be eaſily decided. Where there are ſheltered glens, or variety of expoſure, ſkirted by bruſhwood, in the lower grounds, the Cheviots

are

are likely to thrive. Where theſe do not occur, the black-faced ſhould be adopted. The propriety of attempting to improve the native breed has already been hinted at.

With regard to the low lands of Arran, the ſoil, where it is formed from the decompoſition of red ſandſtone and ſhiver, and of whinſtone, is every way ſimilar to the ſoils of Berwickſhire. The climate is alſo remarkably ſimilar, the two places being nearly on the ſame parallel of latitude. Perhaps there may be more rain in Arran, which is ſtill more favourable for ſown graſſes and green crops.

I obſerved one field of turnips, which exhibited an uncommon freſhneſs and luxuriance. They had not been thinned, or properly managed; but where they happened to be thin by accident, they had attained an uncommon ſize. The fly, worm, and other inſects which deſtroy turnips in other places, are not known here.

It would therefore be proper to ſubject the cultivateable lands to the Berwickſhire ſyſtem of alternate cropping and paſture, having a green crop interpoſed between every two white crops. One field, which had been limed and laid down in graſs, exhibited an uncommon luxuriance and cloſeneſs of pile. In moſt ſituations, it would let for five pounds per acre in paſture.

Manures.

These are chiefly the dung of cattle, which they mix with turf. This practice occaſions the deſtruction of much valuable ſurface, and fills the infield land with weeds.

The clay marl, which was ſtated to abound in many places, had probably been derived from the decompoſition of ſuch marly ſtrata as were deſcribed to accompany the limeſtone with a greater or ſmaller mixture of other earths and ſtones. It would anſwer much better than turf for making compoſts; and on looſe, ſandy, gravelly, or moſſy ſoils, would prove of great utility without any mixture of dung. Where this does not abound, they ſhould make their compoſts of ſwampy earth, or moſs, which would anſwer for all ſoils except moſs.

The ſmall ſhell-fiſhes which accumulate ſhell-marl, abound in Arran; but though the ſwamps were explored with great care, no accumulations of this marl, of any conſequence, could be found. It appeared that the animals had been diſturbed, and prevented from accumulating by mountain torrents waſhing earth and ſand into the ſwamps, which were formerly lakes.

During ſpring, they collect drifted ſea-weeds along the ſhores, and apply them as manure.

The

The people on the oppoſite coaſt of Ayrſhire collect theſe weeds every time they are driven on ſhore by a ſtorm, and make them into compoſts with earth; a practice which deſerves to be adopted by the people of Arran.

Analysis of Limestone.

Arran abounds in limeſtone; and it occurs either in veins, or in ſtrata. When in veins, it is ſparry, or conſiſts of rounded pieces of chalk, immerſed in a chalky ground, of a greyiſh colour. In one caſe, angular fragments of ſtratified limeſtone are intermixed with the chalk. The chalky ſtone, when ſtratified, contains a greater or ſmaller proportion of rounded adventitious ſtones intermixed. The other ſtratified limeſtone contains ſea-ſhells; and the marly ſtrata which alternate with it, contain impreſſions of ſhells, and of marine plants. When this occurs in a group of red ſandſtone ſtrata, there is always a bed of white ſandſtone next the limeſtone. The blood-red limeſtone, which abounds from Currie to the Cock, though ſtratified, does not exhibit any ſhells. This ſpecies has not been uſed; and therefore, it did not attract particular notice. The propriety of trying whether it would ſerve the purpoſe of puzzolana, has been already ſuggeſted.

The following analyſes were made upon theſe ſtones, in ſo far as they were obſerved to differ in colour and fracture; and may be reckoned to expreſs the average purity of Arran limeſtones.

1. South Currie quarry contains,

Carbonate of lime -	98½
Clay - - - - -	1½
	100

2. Rented quarry of Currie.

No. 1.	Carbonate of lime -	90½
	Clay and ſome iron -	9½
		100
No. 2.	Carbonate of lime -	97
	Clay and ſome iron -	3
		100

3. Alcrappoch limeſtone, head of Benleſter glen, behind Lamlaſh.

Carbonate of lime -	96
Iron - - - - - -	3
Clay - - - - - -	1
	100

Parts

Parts of this vein are chalky, and others ſparry. The latter ſeems to approach abſolute purity. But it contains many fragments of a reddiſh brown or blue limeſtone, which appear to have been detached from ſtrata, on one of which the analyſis was performed.

4. Glenluig chalky limeſtone.

Carbonate of lime -	98
Clay - - - - - -	2
	100

This may be conſidered as expreſſing the average purity of the indurated chalky rocks of Arran, in ſo far as they are not contaminated by a mixture of adventitious ſtones. The particulars relative to theſe intermixtures have been already pointed out.

It will hence appear, that Arran abounds with limeſtones of uncommon good quality. Were the Ardroſſan canal completed, abundance of ſmall coal could be procured, at a cheap rate, for burning limeſtone. It might then be found expedient to eſtabliſh draw-kilns, of the beſt conſtruction, for ſupplying the lands of Arran with this uſeful manure, and for exportation. Veſſels with double bottoms, ſuch as Lord Elgin uſes, are known to carry lime by ſea, to all places, with the utmoſt ſafety.

ROADS.

Roads.

The Dutcheſs Ann, who ſeems to have been a woman of a ſtrong mind, and far beyond the barbarous age in which ſhe lived, firſt began the making of roads in Arran; and, as far as I could learn, excepting a few repairs, they never have been carried further than ſhe left them. But, unfortunately, in her time, the proper lines of roads were not underſtood. In place of going round a hill, they went ſtraight over its top. This may eaſily be accounted for from the ideas of thoſe times. Wheel carriages, and their accommodation, did not enter into their thoughts, becauſe they were hardly known. Roads on which people could ride without breaking their necks, and on which horſes could carry a heavier load than they could on rugged precipices, was all that entered into their contemplation.

It is unneceſſary to enter minutely into this ſubject, becauſe it cannot be underſtood, except by people upon the ſpot. I only beg leave to offer a few general remarks.

Arran requires a road all round her, and one from the head of Broddick Bay to Shiſkin. In this extenſive tract, great part of the road is already made by nature; and the reſt, in moſt caſes, only requires formation. In the track round the iſland,

iſland, four difficult paſſes occur; but an obſervant eye can ſee a moſt eaſy road through them. No ſtone bridges exiſt in Arran; but a few are neceſſary; and nature has marked poſitions where a very ſmall arch can be thrown from rock to rock, ſo ſituated as moſt effectually to render the road beneficial. In a few caſes, gullies muſt be paſſed by a ſlope cut in the bank on each ſide.

In addition to theſe great lines, a few accommodation roads are neceſſary, to carry lime, or other manures, to improveable land; or to form communications between the cultivated land, and the propoſed fiſhing ſtations on the ſea-coaſt. Theſe collateral roads may be executed when their neceſſity becomes obvious.

The great lines are ſo indiſpenſably neceſſary, that Arran cannot take advantage of its ſoil; improve its fiſheries; or become the theatre of thoſe manufactures, for which I have explained her adaptation, without them.

I have ſtrongly recommended taking advantage of the generoſity, and, I may add, patriotiſm of Government: and fondly hope my recommendation will not prove fruitleſs. I hope that the good intentions of Government may produce a ſuitable cooperation on the part of our Highland chieftains; and that the Highlands and Iſles, by improving their inexhauſtible reſources, may become the right

arm

arm of the empire, ready to hurl her thunders around the globe.

Woods and Plantations.

It has been ſtated, that a great part of this iſland was anciently covered with wood; and conſiderable tracks of it are yet natural ſtools of birch, oak, aſh, aller, willow, and various ſhrubs. The ſervice tree is ſeen to rear itſelf far up the ſides of the granite mountains, regardleſs of all the ſtorms with which it is aſſailed. At Arran Caſtle, and other places, there are a few plantations which thrive remarkably well. Here none of the diſeaſes, or paraſytical plants, or inſects, which injure trees in other places, are known. Their bark is always clean and healthy; their ſhoots vigorous.

It would be proper to encloſe and plant the vacancies in the natural woods. Were the numerous ravines which are moſtly ſprinkled with natural wood, encloſed and planted, they would be converted into belts both for ornament and ſhelter. There are alſo many ſtony places, which do not admit the plough; but are well adapted for trees. Were all the parts in Arran which are fitted for trees, and nothing elſe, planted, and the trees preſerved; in a courſe of years the wood would

would be of more value than the iſland is at preſent. In thoſe places where clay marl was deſcribed to abound, where there are ſheltered dells, and hanging banks with a ſouthern expoſure, and marly bottom, fruit trees would thrive admirably, and be productive of much profit.

CLIMATE.

THE climate here is conſidered as rather moiſt, though the oppoſite extreme prevailed while I ſojourned in Arran. The gravelly and ſandy ſoils need much rain; and it is only by frequent repetitions of moiſture, that they can be brought to carry either corn or graſs. They have another defect, that all the putreſcent manures applied to them are moſtly waſhed through the ſoil in one ſeaſon; ſo that their application is like pouring water into a ſieve. Clay marl, where it is near, has been recommended as the moſt powerful and moſt permanent corrective of the defects of theſe ſoils. Where it is remote, moſſy or earthy compoſts may ſupply its place.

With regard to temperature, this iſland, and other places on the weſt coaſt, interſected by the ſea, are not underſtood to be ſo warm in ſummer, nor ſo cold in winter, as other places on the ſame parallel, and of the ſame elevation, on the eaſt.

Nor

Nor does the medium temperature vary ſo much, as it does in the broadeſt part of the iſland, towards the ſouth of England. Still leſs does the temperature vary ſo much, as it does on the ſame parallel, on the oppoſite continents of Europe and America.

In Arran, ſnow ſtorms come from the north-eaſt, or eaſt. Having many mountains to croſs before they reach this iſland, they are moſtly exhauſted before they arrive. Though ſnow ſometimes lyes long on the granite mountains, it ſeldom remains a few hours on the low grounds; and, on the ſea-ſhores, it is ſpeedily diſſolved.

This marks the adaptation of this iſland, and of other places ſimilarly ſituated, for winter crops of every kind. Towards the ſouth of Arran, where clay predominates, or the ſoil can be corrected by clay marl, wheat would thrive admirably. The ſoil and climate both admirably cooperate for raiſing turnips, yams, potatoes, and every ſpecies of roots; vetches, ſown graſſes, and every ſpecies of green crop. Nor is the climate and ſoil leſs favourable for improving the natural herbage which grows upon the mountains, or higher grounds, as already pointed out.

In excurſions of this ſort, it is not poſſible to aſcertain the medium temperature of a climate, by regular obſervations, taken at the ſame place, and at certain hours of the day. I uſually carry a portable

portable thermometer in my pocket, and aſcertain the temperature at different times, when my attention is not attracted by other objects, and at different elevations from the level of the ſea. The late Dr Walker contrived a plan for aſcertaining elevations by the thermometer; which was founded on the degrees of heat at which water would boil, at the ſame time, and at different elevations. There ſeems to be no doubt but this plan would prove more accurate than barometrical meaſurement. But another idea of his, that different thermometers, at different elevations, would indicate degrees of heat, at the ſame inſtant, correſponding to theſe ſeveral elevations, does not ſeem to be ſo well founded. In fact, in elevated grounds, and even on the acclivity of mountains, the temperature is regulated more by local circumſtances, than by the abſolute elevation. Theſe circumſtances it is needleſs to enumerate; but they may be reduced to a few general heads—ſuch as the expoſure; the radiation of heat from the rocks; the wetneſs or dryneſs of the ſoil, &c.

Having loſt the record of the temperature of ſoils in Arran, I can only ſtate, from recollection, that wet ſoils varied from 44° to about 54° of Fahrenheit; while dry earth, expoſed to the ſun's rays, varied from 100° to 120°. In other places, I have known a highly cultivated, and well manured

nured ſoil, amount to 150°; while the temperature of the atmoſphere did not exceed 60°.

This ſhews the powerful effect of draining and cultivating land, in improving the temperature of a climate.

The following table, being a ſelection from many obſervations while I was in Arran, may ſerve to exhibit a general idea of the temperature of its atmoſphere, during ſummer. It is only neceſſary to obſerve, that the temperature, at high elevations, is often greater, on the ſame day, than that in the lower regions. But that is eaſily accounted for, by conſidering, that ſetting out in the morning, or early in the forenoon, the ſun's rays were increaſing the temperature of the places to which I aſcended, and more ſo, perhaps, that of thoſe which I had left. Often when I returned down to the place from which I ſet out, the temperature, in the evening, was much lower than when I left it in the morning; and lower than that on the tops of the mountains. This, from what is ſtated, may eaſily be accounted for.

The firſt column exhibits the day of the month; the ſecond, the time of day when the obſervation was made; the third, the place, or local ſituation; the fourth, the temperature by Fahrenheit's thermometer; the fifth and laſt, general remarks.

TEM-

TEMPERATURE OF ARRAN.

1803.

Day of Month.	Hour of Day.	PLACE.		REMARKS.
June29.	11 A.M.	Above Arran Parks -	68°	Calm, ſunſhine.
	1 P. M.	Shoulder of Goatfell -	62°	Do.
	2 P. M.	Top of Do. -	61°	Do.
	5 P. M.	Arran Caſtle - - -	69°	Do.
31.	11 A.M.	Bottom of Glenroſa -	61°	Do.
	2 P. M.	Head of Do. - -	69°	Do.
July 1.	Noon.	Head of Broddick Bay	66½°	Cloudy, ſome rain.
	4 P. M.	Top of Clachnadun -	61°	Do.
8.	1 P. M.	Head of Monymore Glen	58°	Do.
	3 P. M.	Top of Garbin - - -	51°	Do.
10.	Noon.	Lamlaſh Iſland - - -	73°	Calm, ſunſhine.
	2 P. M.	Do. - - - -	70°	Breeze from ſouth-weſt.
	3 P. M.	South Point of Do. -	65°	Breeze increaſed, cloudy.
11.	1 P. M.	Lamlaſh village - -	70°	Calm, ſunſhine.
13.	Noon.	Do. - - - -	73°	Do.
	5 P. M.	Whiting Bay - - -	71°	Do.
14.	8 A.M.	Do. - - - -	65°	Do.
	Noon.	Head of Glen Aſhdale	73°	Do.
	3 P. M.	Top of Knocknecarleu	76°	Do.
	5 P. M.	Near the ſea-ſhore - -	76°	Do.
	9 P. M.	Do. - - - -	70°	Do.
15.	Noon.	Near Lamlaſh - - -	78°	Do.
		Heat of ſoil at ſame place	122°	Do.
18.	2 P. M.	Kildonnan - - - -	76°	Do.
	3 P. M.	Do. - - - -	79°	Do.
24.	3 P. M.	Holme of Sliddery -	62°	Some rain.
				Showers continued from time to time for ſeveral days.
Aug. 2.	—	- - - - - - - -	—	Loud thunder, with hail and heavy rain.
3. 4.	—	- - - - - - - -	—	Showers continued.
7.	Noon.	Sea-beach - - - -	62°	Broken clouds.

TEMPERATURE OF ARRAN continued.

Day of Month.	Hour of Day.	PLACE.		REMARKS.
Aug. 8.	10 P. M.	- - - - - - - -	—	Loud thunder, heavy rain.
10.	2 P. M.	South-End - - - -	59°	Thick fog, afternoon heavy rain.
12.	Noon.	Do. - - - -	63°	Sunshine, breeze S. W.
14.	2 P. M.	Auchinreach Farm - -	68°	Do.
	3 P. M.	Do. - - - - -	70°	Do.
15.	1 P. M.	Moors above Glen-Scordel	75°	Calm, sunshine.
	3 P. M.	Glen-Scordel - - - -	75°	Do.
	6 P. M.	Do. lower down - - -	70°	Do.
22.	Noon.	Darineach Farm - -	60°	Thick fog, followed by heavy rain.
	7 P. M.	Do. - - - - -	54°	Do.
				During several days weather irregular, and some excessive rains.
29.	2 P. M.	Top of Ardvein - - -	48°	Showers, wind north.
Oct. 14.	Noon.	Arran Castle - - -	60°	Sunshine, breeze S. W.

This was the day I left Arran; but many variations of weather, and excessive rains, occurred in the intervals, when I either had not time to observe the temperature, or, if observed, did not make an accurate record.

MANU-

MANUFACTURES.

Kelp.

Quantities of kelp are manufactured along the ſhores of Arran, on account of the proprietors. The people who conduct the proceſs are allowed a certain rate *per* ton, or they obtain a deduction from their rent to the amount that may be agreed on. This manufacture does not ſeem to be profitable, either to proprietors or to tenants. It is very unprofitable to the proprietors, becauſe the kelp is generally ſo bad, that they ſeldom get more for the article than will cover expenſes; and by diverting the labour of tenants from their land, at the moſt important ſeaſon of the year, the manufacture of kelp contributes to prevent that increment of value, and riſe of rent, which their labour would ſoon convey to the land. Indeed, until proprietors adopt a judicious diviſion of farms into ſeparate poſſeſſions, no man can be expected to labour more upon land than uſage demands; and he cannot be ſuppoſed to go more heartily into the buſineſs, than a decent regard to appearances requires. To expect more, would be to ſuppoſe him a fool, or a madman. It is needleſs, therefore, to ſhow how this diverſion of the

farmer's labour is prejudicial to him. It may be received as a maxim, that whatever diminiſhes the landlord's rent, is prejudicial to the farmer, and *vice verſa*. Put it in the power of a tenant to make himſelf rich, and he will ſoon make his landlord rich: but involve the latter in a ſyſtem by which he muſt, of neceſſity, remain poor, and his landlord will not derive one tenth part of the benefit from his labours he otherwiſe might; and this is the preſent ſtate of the iſland of Arran.

A great part of the ſea-ebbs of Arran are unfavourable to the growth of ſea-weeds. The rocks are moſtly ſandſtone, or micaceous ſchiſtus, or ſlate, or puddingſtone, &c. which do not afford a ſufficiently ſolid, or ſmooth ſurface, to which the weeds can attach themſelves. Great tracts are alſo occupied by rounded ſtones, which are moved and toſſed by every ſtorm, ſo as to wear off every plant which may have faſtened itſelf to ſuch ſtones. In the bays, ſoft mud, or ſand, prevails, to which no ſea-plant can attach itſelf.

Theſe plants ſeem to attach themſelves to rocks, by taking advantage of the ſame law of nature, which many ſpecies of ſhell-fiſhes employ, in order to produce their adheſion to rocks. This is by creating a partial vacuum, or excluſion of air, from between the root, or rather baſis of the plant, and the ſtone; which occaſions the root to be preſſed towards the ſtone by all the difference between

between the weight of the atmoſphere, and the partial vacuum within. Of this we have an illuſtration in the way that boys amuſe themſelves by pulling up large ſtones, by wet rounded pieces of leather, with ſtrings faſtened in their centre. When a piece of this leather, in a pulpy ſtate, is applied to a ſtone, and pulled by the ſtring, at right angles to its ſurface, a partial vacuum is produced, which cauſes the atmoſphere to preſs violently on thoſe parts of the leather in contact with the ſtone, from which the air has been withdrawn towards the hollow, formed by the pull of the ſtring. As long as the leather remains moiſt, the atmoſpheric air cannot re-enter the ſpace betwixt it and the ſtone; and the ſtone muſt be conſidered as a body glued to the leather, by the preſſure of the atmoſphere.

Moſt ſhell-fiſhes, which adhere to rocks, have a ſlight degree of locomotive power, and if dexterouſly ſurpriſed while attempting to move, or while holding themſelves open to catch prey, they may be turned over by a ſtraw. But if they be alarmed, in the ſlighteſt degree, they inſtantly throw out numerous air-bubbles, and faſten themſelves firmly to the rock. This is evidently a proceſs by which they create a partial vacuum in their ſhell, and exclude the air, which the pulpy membrane round its mouth prevents from returning, juſt as was deſcribed in the boy's ſucker. If the rock

be ſmooth to which they adhere, they can ſeldom be removed without breaking the ſhell. But if it be ragged, or arenaceous, they can eaſily be turned over by thruſting a ſpike into an inequality below the rim of the ſhell.

Sea-plants derive no ſubſiſtence from their roots, which only ſerve to fix them upon the rocks. They poſſeſs no locomotive power, like the ſhell-fiſhes; but I am confident they adhere to the rocks from the ſame cauſe. I have often tried to diſengage them, and thought they parted more eaſily when attacked by ſurpriſe, than when warned of my intentions. They ſeem to poſſeſs a power of increaſing the vacuum which binds them to the rocks, in proportion to the violence with which they are aſſailed. That ſea-plants are bound to the rocks by atmoſpheric preſſure, I am fully convinced; and that they poſſeſs a power of increaſing this preſſure, by rarefying the vacuum which occaſions it, ſeems highly probable: but, in the caſes alluded to, the eaſe with which a plant could be diſengaged from the rock, or ſtone, to which it adhered, might be owing to ſuperficial inequalities in the rock, or to ſoftneſs and poroſity, which obſtructed the formation of a vacuum; thoſe upon ſmooth and hard ſtones, adhering moſt firmly. The opinions advanced acquire additional confirmation from this circumſtance, that theſe plants always grow with greateſt luxuriance where currents

rents are ſtrongeſt, or waves moſt violent; provided there be proper rocks on which they can faſten. This ſhows that their power of creating vacuum, or their means of adheſion, is proportioned to the violence with which they are aſſailed.

It is needleſs to enter into a deſcription of the various tribes of marine plants, as they are well known. Each tribe grows at a particular depth in the ebb, with all the regularity of the zones of the globe. In Arran they grow beſt upon whinſtone veins, or upon large ſtones within tide. On ſandſtone and puddingſtone, &c. they grow very imperfectly. Many places might have large ſtones rolled down from the beach, to increaſe the ſurface occupied by marine plants.

Nor is the beach favourable for burning the plants into kelp, as it affords no turf, and is moſtly occupied by ſand, or ſtones. Hence much of it vitrifies with the ſand, and it is often contaminated with ſtones. It hence ſeems expedient to adopt Colonel Fullarton's kilns here; and theſe might be eſtabliſhed at the north and ſouth ends, where great quantities of plants are frequently drifted in. Theſe kilns might be conſtructed upon a flat-bottomed boat, which might move round from creek to creek, and conſume all the ſea-weeds in ſucceſſion. I am confident that other valuable products, beſides alkaline ſalt, might be extracted

from ſea-weeds, and that theſe plants might acquire a great value. Were this plan adopted, the management of them might become a ſeparate profeſſion; and the ſeparation of profeſſions is of great importance in the Highlands and Iſles.

If ſuch kilns as Colonel Fullarton's are not adopted:—on ſuch beaches as thoſe of Arran, kilns of the uſual dimenſions and form ought to be conſtructed with fire-bricks, with moulds of the ſame to receive and cool the liquid kelp; and to operate night and day, until all the plants within their reach are conſumed. The bricks may then be removed to another ſtation; or the whole apparatus may be erected and carried round, on flat-bottomed boats.

Iron, &c.

The two ſtreams of North and South Sannox, might eaſily be made to unite, and to afford water-falls of great power. Here a manufacture of bar-iron and ſteel might be eſtabliſhed with every proſpect of ſucceſs. Were the natural woods along this coaſt properly managed, they might afford an abundant ſupply of charcoal.

Here alſo a pottery might be eſtabliſhed, having moſt of its operations performed by water-force, and the materials furniſhed by the iſland itſelf.

itſelf. Other ſtreams have been pointed out, which are adapted for machinery of great power.

Wool, Lint.

It has already been ſtated, that the women manufacture moſt of the woollen cloth that is uſed in the iſland. There is a dyer and fuller eſtabliſhed near Lamlaſh, who dreſſes the cloth, and it is far from being inelegant. I have often admired the brilliancy of the Highland dyes, and aſcribe it partly to the purity of their water. There are ſome ſtrong chalybeate ſprings among the ſouth hills of Arran; but, in other caſes, the ſprings are remarkably pure. Were the mountains ſubjected to a proper ſyſtem of ſheep-farming, it would be eaſy to ingraft upon the knowledge the people have already acquired, a woollen manufacture. Many of the operations, ſuch as carding, roving, &c. might be performed by water power; and where the hand is neceſſary, the women are already well qualified to execute the work.

Small patches of excellent lint are raiſed in Arran, and ſpecimens of very fine linen are manufactured. But they labour under inſurmountable diſadvantages. Having no lint-mill in the iſland, they are obliged to carry the lint to mills on the mainland, in order to be dreſſed. Were

a lint-mill or two conſtructed here, the growing of lint, and the manufacture of linen, might be carried to a great extent. Though lint be reckoned a ſcourging crop, this can have no effect where there is ſuch abundance of manure. It has one advantage, that it requires the land to be very clean, and highly pulveriſed; and it anſwers better than barley for ſowing graſs ſeeds. The women here are excellent ſpinners; and were obſtructions only removed, a linen manufacture is likely to flouriſh without further encouragement.

FISHERIES.

FISHERIES.

The late Reverend Gerſham Stewart, in conjunction with ſome gentlemen at Glaſgow, endeavoured to eſtabliſh a white fiſhery in Arran, with a view to ſupply the city of Glaſgow with fiſh. Their plan was, to land the fiſh at Saltcoats, and from thence convey them to Glaſgow on the backs of horſes. But the roads at that time were very bad, and the citizens of Glaſgow did not diſcover ſuch a reliſh for fiſh as they have done ſince. The conſequence was, that all the zeal of Mr Stewart was not able to keep the ſcheme alive; for, after languiſhing ſome time, the project was dropped.

Were the intended canal from Ardroſſan to Glaſgow completed, ſeveral parts of the iſland of Arran would become moſt advantageous fiſhing ſtations; and this canal would infuſe new life into all the fiſheries of the Weſt Highlands. A boat loaded with fiſh, entering the canal at Ardroſſan, would reach Glaſgow in ſix hours, paſſing by Paiſley, and an almoſt continued chain of manufacturing towns and villages.

A colony of fiſhers from Nairne and Banffſhires, has long been eſtabliſhed at Ayr. Theſe people

people are very induſtrious, and are ſaid to have made fortunes. They ſend detachments to different parts of the coaſt of Arran, to fiſh during ſummer. Their fiſh is landed at Ayr, and conveyed to Glaſgow, and ſometimes even to Edinburgh, by land.

The fiſh caught in theſe ſeas are cod, ling, congor eels, haddocks, and a variety of ſmaller fiſhes; ſkate, flounders, ſoles, turbots, lobſters, partons, and various ſhell-fiſhes.

In order to improve the fiſheries here, portions of the population ſhould be detached from the land, and induced to derive the whole, or greateſt part of their ſubſiſtence, from this employment. At firſt, it may not be practicable to detach them wholly from the land; and they may have ſmall lots of waſte ground aſſigned them near the fiſhing ſtations, to be encloſed and cultivated during the intervals of fiſhing. I met a man at Currie, who offered to take three or four acres of the waſte land above the bank, at 20s. per acre, on a nineteen years leaſe, to encloſe, and reduce it into cultivation. He alſo offered to build a ſubſtantial houſe of two ſtories, near the harbour, on a building leaſe of ninety-nine years, which might ſerve the double purpoſe of a dwelling and ſtore-houſe; and to devote the greateſt part of his induſtry to the fiſheries. This would certainly be a lucrative ſpeculation for proprietors, becauſe the land he propoſed

propoſed to encloſe and cultivate, does not now yield a penny per acre. Were this plan carried into effect at all the fiſhing ſtations, much waſte land might be reclaimed, which, when the leaſes expired, might be aſſigned to farmers, as the fiſhers would now find it to be for their advantage to devote the whole of their attention to their proper employment.

The ſtations proper for ſuch eſtabliſhments in Arran, are, 1. At Loch Ranſa, where nature has formed a moſt commodious harbour, which a trifle of expenſe would improve. 2. At Currie, where there are two harbours cut out of the ſolid rock, which might be very much enlarged; and the ſale of the ſtones would amply defray the expenſe. 3. Below Arran Caſtle, where a ſmall harbour might be cut in the ſandſtone ſtrata, to which the ſtones would form a parapet. 4. At Lamlaſh, where a very elegant harbour was moſt imprudently demoliſhed. This harbour might prove a great accommodation to general trade. It would be an excellent ſituation for building and repairing ſhips; and might be conſtructed by a ſmall anchorage rate on the numerous veſſels which frequent the bay. As an equivalent for this rate, buoys might be dropped to mark the entrance into the bay from the north, ſo that veſſels might enter with equal ſafety at either end. 5. At Whiting Bay, where the people have already made a

ſmall

ſmall harbour, by arranging the ſtones upon the beach. 6. On, or oppoſite to, the iſland of Plada. 7. Below the farm of Corrychrevy, on the ſouth end. Here a bank is ſaid to extend from the Iron iſland, acroſs the frith, to the rock of Ailſa, which ſwarms with cod, ling, haddocks, and various other fiſhes. 8. At the mouth of Blackwater, oppoſite to Campbeltown. 9. At Machry, as already deſcribed.

Each of theſe ſituations poſſeſſes peculiar advantages; and were any one of them occupied by ſkilful fiſhers, much benefit would reſult, not only to Arran, but to the country at large.

Shoals of herrings often frequent the coaſt of Arran; and this is the only fiſhery in which the people here ever engage. It is chiefly proſecuted by young men, in ſmall boats, who repair to Lochfine, or wherever the herrings are known to abound. They are ſold to *cowpers*, or hawkers, who convey them to market in a freſh ſtate; or to buſſes, which come provided with ſalt and caſks for curing them. In 1803, this fiſhery was ſuppoſed to bring into Arran from 1500l. to 2000l., beſides conſiderable quantities of herrings, cured by Iriſh ſalt, for their own conſumption. The young men who engage in it, generally make as much as maintains them all the year; and unleſs they embark in a trading voyage, they paſs the remainder of their time in idleneſs. This ſhews the

the neceſſity of combining the white with the herring fiſhery, as by ſo doing the fiſhers might have conſtant employment all days of the year.

The Government bounties on the herring fiſhery were intended originally to excite the Dutch mode of fiſhing in the deep ſea; though in no caſe have they been productive of that effect. They ſeem to have failed, from the aſſumption, that ſuch large and expenſive veſſels as the Dutch employ, at a great diſtance from their ports, were neceſſary in the land-locked ſeas of the Weſt Highlands, where, if ſtorms ariſe, a veſſel can, in a few hours, reach a ſafe harbour. It would appear that veſſels of from 15 to 20 tons, half-decked, and furniſhed with a ſufficient length and depth of nets, would be amply ſufficient for the deep fiſhery in ſuch ſeas. Or ſuch veſſels and tackle as are uſed at Yarmouth, might be employed with advantage. Each veſſel ſhould have a cooper, and a ſufficient aſſortment of ſalt and caſks; and the men ſhould gut and cure, during the day, all that were taken the preceding night. When a cargo is completed, they can return with it to their port, where it is to be repacked and more attentively cured by the people on ſhore. Meanwhile the veſſel may return for another cargo; and, in this way, many cargoes may be completed in the courſe of one ſeaſon.

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The advantage of this would be two, or perhaps three, months added to the period of fiſhing; and when the herrings removed to the bays or coaſts, ſuch veſſels might follow them, and take them with more effect than the ſmall boats and nets now employed. When the herring fiſhery ceaſed, ſuch veſſels would be well adapted for the long lines uſed in the cod and white fiſhery. Thus fiſhing, inſtead of being an occaſional employment, awkwardly conducted, would become a diſtinct profeſſion, proſecuted all days of the year, with vigour and effect. I conceive Government ſhould endeavour to incite a few to try this experiment, by ſuitable encouragements.

For the North-weſt Highlands and Iſles, from which markets are more remote than they are from Arran, well-boats ſeem indiſpenſably neceſſary to the proſperity of the fiſheries, in order to convey part of their produce to market in a living ſtate. According to the direction of the wind, theſe boats might furniſh an abundant ſupply of fiſh, not only to the towns on the weſt of Scotland, but alſo to thoſe on the weſt of England, and on the north and eaſt of Ireland. They might alſo bring back groceries, and many other articles, which the want of regular intercourſe cauſes to be of enormous price, and of very bad quality, in the North-weſt Highlands and Iſles.

Beſides

Beſides the cod, ling, haddocks, &c. which may be conveyed alive in well-boats, the coaſts of Lewis, and of other Iſles I have viſited, ſwarm with lobſters, partons, &c. of the moſt enormous ſize and delicious flavour. Many bays of Lewis, of Skye, and on the oppoſite mainland of Roſs and Inverneſsſhires, which I have ſeen, abound with oyſters of excellent quality; and I doubt not but they may alſo abound in many other bays, which I had no opportunity of examining. Theſe could be conveyed, alive, to very diſtant markets in well-boats; and each ſpecies, in its ſeaſon, might afford conſtant employment to ſuch boats. What could not be inſtantly ſold, might be pickled and preſerved for future uſe.

It is obvious theſe ſeas cannot be properly fiſhed by veſſels coming from diſtant ports; and the end can only be attained by capitals, veſſels, and a numerous population of expert fiſhers, diſtributed at all thoſe ſtations which are neareſt to the ſcene of action. Well-boats would return ready money, or goods, for part of the produce, and enable the fiſhers to wait the more diſtant returns for their pickled produce.

The great advantage of Arran, as a fiſhing ſtation, is its acceſs to markets where much of the produce may be ſold in a freſh ſtate. But an ample ſtore of ſalt is neceſſary to preſerve what cannot be ſo diſpoſed of, otherwiſe the fiſheries cannot be

profecuted with advantage. The drawback of the duties allowed by Government, is loaded with fo many formalities, obligations, and penalties, that very little advantage refults from it to the fifheries. The quantity of falt diminifhes from dampnefs; and thus, neither an overplus, nor deficiency, can be accurately accounted for. Hence no advantage is taken of this drawback of duty by the people on the fpot; and the only people who profit by it, are thofe who fit out veffels from ports very remote from the fcene of the fifhery. Often vaft fhoals of herrings come into bays, where there are none of thefe veffels with their falt and cafks; and when they do arrive, they combine to impofe what price they pleafe upon the fmall-boat fifhers, who have no other market for their produce, in fituations where the herrings cannot be difpofed of in a freth ftate. The cafe would be very much altered, were falt, free of duty, and of every reftraint, put within the reach of every crew which could fit out a boat. They would profecute the fifhery with redoubled affiduity; and the prefent buffes would become mere coafters, whofe only bufinefs would be to go round, and convey the cured fifh to a market.

Mr Addington's plan of repealing the duty on falt, feems to have failed, from not being able to find a fubftitute. Meanwhile, my ingenious friend Mr Fraſer, in his letter to Mr Abbot, propofes that falt fhould be allowed to be imported to all

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the fiſhing diſtricts of the Highlands and Iſles, free of any duty or reſtraint whatever. It appears from his ſtatement (though I have not his pamphlet before me), that all the revenue ariſing from ſalt in theſe diſtricts, does not amount to 200l., while its collection coſts many thouſands. Thus ſuch a conceſſion, ſo far from coſting Government any thing, would prove a great ſaving of expenſe. He propoſes to render the ſmuggling of this ſalt, into the diſtricts liable to the duty, felony. I have no objections to make the penalty very high; though I ſee no uſe for ſuch ſeverity. It would not be the intereſt of the people to ſmuggle this ſalt, but to export it in combination with fiſh: and men are ſeldom ſeen to commit crimes which are manifeſtly contrary to their intereſt.

Mr Fraſer does not advance this propoſition as a ſpeculative theory; but refers to the Iſle of Mann, where it has long been eſtabliſhed; and where, without creating the ſlighteſt tendency to ſmuggle, it has been productive of the moſt beneficial effects on the fiſheries. I conceive Government need not heſitate to try this experiment during a limited period, in the fiſhing diſtricts pointed out by Mr Fraſer.

But the ſucceſs of the fiſheries does not ſolely depend on having ſalt cheap and abundant in every cottage of the Highlands and Iſles: the ſalt

muſt alſo be of the utmoſt purity, and adapted for the preſervation of fiſh in all latitudes.

The bay ſalt, though highly cryſtallized, is mixed with ſo much mud and ſediment, waſhed down by rivers, and beat back by the ocean, that it carries the *fomes* of putrefaction in its compoſition; which the perfection of its cryſtals may reſiſt, but cannot wholly counteract. Accordingly, the Dutch never uſe this ſalt, without melting it down in pure ſea-water, which they bring from a great diſtance; allowing the ſediment to depoſit; and afterwards ſubjecting the limpid ſolution to a new cryſtallization.

But why have recourſe to St Ubes, or to any Saint that ever exiſted, for materials which the Britiſh iſland furniſhes in the utmoſt abundance?

At an early period of my life, from pedeſtrian excurſions into the Highlands, where I happened to ſtumble upon lochs or bays where the herring fiſhery was going on, this ſubject was forcibly impreſſed upon my mind. I made numerous experiments, with a view to diſcover an eaſy and ſimple proceſs for purifying ſalt. At the commencement of the Highland Society, I gave in a paper, which they honoured with their firſt and higheſt premium. This paper they have loſt; and having preſerved no notes, my memory retains only a confuſed recollection of the particulars.

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As far as my recollection extends, I think I ſtated, that the fiſheries required two ſpecies of ſalt; one of ſmall grain; the other in large cryſtals; but both of the utmoſt purity. I pointed out various modes of purifying the ſmall-grained ſalt; the moſt efficient of which, as far as I can recollect, were certain precipitates. With regard to the large-grained, or cryſtallized ſalt, I deſcribed ſeveral proceſſes which I had tried; and the one to which I was moſt partial, I ſhall attempt to deſcribe. It conſiſted of a broad and ſhallow pan, placed above the pans in common uſe, to be charged with purified ſaturated ſolution of ſalt, which was to be cryſtallized by the heat of the ſteam emitted from the pan below. I preſented plans of ſuch a work, by which it was made evident, that while ſmall-grained ſalt was boiled in the pan below, the heat of the upper pan might be regulated by a thermometer, and might produce all the perfect cryſtallization of the warm climates, without any of the putreſcent ingredients which there adulterate the ſalt.

My ingenious friend Dr Coventry has lately invented a method, ſimple and effectual, for purifying ſmall-grained ſalt of the *magneſia ſalita*, and other deliqueſcent ſalts, which render marine ſalt incapable of preſerving fiſh, and of other uſeful purpoſes. Far be it from me to divulge what was communicated in the confidence of friendſhip; but

I conceive that Parliament, and public bodies, are called upon to elicit, by ſuitable remuneration, the divulgence of the Doctor's ſecret. The good—I may even add—the ſafety of their country, loudly demands this meaſure.

Moſt of our Scottiſh ſalt pans, and even thoſe of England, are ſituated in the mouths of rivers, where the proportion of ſalt is much diminiſhed by the freſh water which mixes with that of the ſea. The ſalt water uſed in the pans is likewiſe conſtantly muddy, and charged with much putreſcent matter waſhed down from the land. To get rid of theſe ingredients, a liberal uſe of blood is neceſſary, which conveys to the ſalt a nauſeous flavour, and impregnates it with a putrefactive *fomes*.

On the ſhores of ſmall iſlands, ſea-water is always clear and limpid, and might be boiled into ſalt without any uſe of blood. It is alſo much ſtronger in ſalt than the brakiſh water at the mouths of rivers. Hence an iſland is the moſt proper ſituation for a ſalt-work, which is to furniſh ſalt of the purity and perfection requiſite for the fiſheries. This has long been impreſſed upon my mind as an indiſputable fact; and after viſiting many iſlands, I have at laſt fixed upon the iſland of Arran as the moſt commodious for eſtabliſhing a great manufacture of ſalt, of ſufficient purity for the fiſheries. By the Crinan Canal, it has an eaſy communication

communication with the other iſlands and fiſhing ſtations on the mainland, all the way to Shetland. It contains coal well adapted for the purpoſe of boiling ſalt, or can eaſily be ſupplied from Ayrſhire. When the Ardroſſan Canal is completed, it can be ſupplied with abundance of ſmall coal, at a cheap rate, from coalleries in the interior country. *

Every attempt that has been made, to procure the importation of Engliſh rock-ſalt into Scotland, has been vigorouſly reſiſted by the coal-maſters and ſalt-boilers, on the eaſtern coaſt. They alleged, not without reaſon, that ſuch a meaſure would give their brethren on the weſt too great an advantage over them; which would oblige them to abandon their ſalt-pans; render their ſmall coal uſeleſs; and, of courſe, render their coal-pits unprofitable.

But I ſee no injury either party would ſuſtain by allowing the importation of rock-ſalt to the iſlands of Arran or Skye, to be manufactured into ſalt ſolely appropriated for the uſe of the fiſheries, or for exportation. It is certain that no particle of their ſalt was ever uſed in the fiſheries, or exported.

I therefore propoſe that a large manufacture of ſalt, from Engliſh rock-ſalt and ſea-water, ſhould be eſtabliſhed at Lamlaſh, or at the head of Brod-

* The author has lately diſcovered much coal in the Iſle of Skye.

dick Bay. The work to have two pans: the lower to make ſmall ſalt, to be afterwards purified in Dr Coventry's method: the upper to make large cryſtals of ſalt, free of every putrefcent ingredient.

It is meant that thoſe who embark in this ſcheme ſhall ſell the ſalt at as low a price as ſhall cover expences, with a very moderate profit. That it ſhall be free of all duty, and paſs without the ſmalleſt reſtraint to all the fiſhing diſtricts pointed out by Mr Fraſer; but it muſt not paſs into the diſtricts where the duties are paid; and if any overplus is manufactured, beyond what the fiſheries can abſorb, it may be exported, but cannot be ſmuggled into the diſtricts liable to duty.

A manufacture of ſalt of the higheſt purity for the fiſheries, within the fiſhing diſtrict, I conceive would render Mr Fraſer's plan more ſimple and practicable. The permit of the manager of the work, would be a ſufficient guarantee for the conveyance of the ſalt, while it kept within its preſcribed limits: a ſecurity which could not be obtained were the ſalt brought from Liverpool, from Ireland, or other places. I conceive our Highland Society would be more profitably employed for their country, were they to deliberate on the means of carrying ſuch a project into effect, than while occupied with other matters, of far inferior importance.

Since

Since the above was written, the author has been favoured with the following letter from his ingenious friend Mr Fraſer, which throws additional light upon the ſubject; and ſhews that the plan of granting ſalt free of duty and reſtraint, which he procured for fiſhing veſſels in the ports on the Thames, has done no harm to the revenue; though, in theſe places, the opportunities of ſmuggling are infinitely more numerous than in the Weſt Highlands and Iſles of Scotland. The author's experiments on ſalt, and the beſt means of applying it, were made when he was a very young man; and he did not know, until informed by this letter, that double pans had been employed in Ireland. This, however, only ſhows that what he had tried on a ſmall ſcale, may be executed on a large ſcale, with good effects; eſpecially when improvements are ſuperadded, which he ſuppoſes are not known in Ireland.

'*The Rev. J. Headrick.*

DEAR SIR, *Perth, December 5.* 1805.

'I WOULD ſooner have anſwered your obliging favour of the 25th of laſt month; but not having a copy of my letter to the Speaker of the Houſe of Commons by me, I did not recollect the particulars you wiſhed to be ſtated. I have found a copy of my publication, which is perfect, excepting the map, which I take the liberty to enclo-

cloſe

cloſe you, and deſire you may make what uſe you think proper of the facts or obſervations contained in it. To the arguments made uſe of to ſhow that no injury can ariſe to the revenue from ſmuggling of ſuch duty-free ſalt, as may be allowed to be made uſe of in the fiſheries, the following obſervation, tranſcribed from a manuſcript of mine, which I ſhall perhaps lay before the public next ſeſſion of Parliament, appears deciſive.

" By an act of the ſeſſion of 1801, for the " better ſupplying the cities of London and Weſt- " minſter with fiſh, both freſh and juſt ſalted, it " is enacted, That all veſſels proceeding from " London, Graveſend, Greenwich, and other " ports in the Thames, ſhall be allowed to carry " out with them ſalt, for the purpoſe of curing " their fiſh, with a drawback of all the duties, " and without being ſubject to give any return of " the quantity of fiſh cured, or any account of " the quantity of ſalt waſted, &c.; entering only " into a bond, that the ſaid ſalt ſhall be uſed on " board the ſaid veſſels. Experience has ſhewn, " that at *thoſe* places where the temptation to " ſmuggle ſalt, from the high price of it, is *great-* " *eſt*, there have been no complaints of any ſuch " frauds, nor could there be any danger from the " ſame privilege being extended generally to all " fiſhing veſſels, *ſince* the *ſalt* has been *put under* " *the excise*, which took place in 1798, becauſe

" the

" the exciſe-officer takes an account of all the ſalt
" kept by dealers, and could eaſily diſcover if the
" quantity was increaſed by any illicit practice.
" There is therefore no neceſſity for the Miniſter
" to make any alteration of the preſent duties,
" much leſs to repeal them, only ſimply to extend
" the proviſions of the ſaid act to the fiſheries in
" general, and particularly to thoſe in the High-
" lands and Iſles of Scotland. I further ſee no
" reaſon why rock-ſalt ſhould not be allowed to
" be manufactured into culinary and fiſhery ſalt
" *ad libitum*, in the ſame manner as tallow into
" ſoap and candles; and I could eaſily prove that
" the revenue would be greatly augmented by
" ſuch a general liberty, inſtead of its becoming
" a monopoly as at preſent, in the hands of a few
" very opulent individuals, ſome of whom have
" acquired, in the neighbourhood of Liverpool,
" fortunes of nearly half a million of money."

'The Scotch ſalt is certainly of very inferior quality to the Liverpool or Iriſh ſalt, made by refining the rock-ſalt, diſſolved in ſea-water. At the principal manufactories in Ireland, they have, for many years, been in the habit of uſing double pans, one above the other; the lowermoſt placed over a draw-kiln for burning lime, the profit on which pays for the fuel made uſe of. Before the late duty of 3l. per ton was put on the importation of rock ſalt into Ireland, there were

numerous

numerous manufactories along all parts of the coaſt of that iſland. But, except at Roe's manufactory at Ringſend near Dublin, I do not find they uſe any method for purifying the brine; nor do they make any quantity of great ſalt; ſo that they are obliged to get St Ubes ſalt for curing their proviſions, which is very expenſive. I fear it would not be eaſy to obtain the privilege of importing rock-ſalt to Arran. Colonel Fullarton tried to get ſuch a privilege for Saltcoats ſome years ago, but could not do away the oppoſition of the Eaſt-country ſalt manufacturers. It was a very blameable neglect of the Highland Society to loſe your papers on the purification of ſalt. If that Society would bend their attention to the object of obtaining duty-free ſalt *ad libitum* to the fiſheries, they would do more good than by all their other operations. I have a very valuable paper in my poſſeſſion, containing a propoſal from a great many Dutch families to ſettle in the Highlands or Weſtern Iſles, bringing their capital and induſtry with them for carrying on the fiſheries. I had alſo a repetition made to me by the Americans, mentioned in Dr Anderſon's letter, publiſhed in the appendix to my letter to the Speaker. But although both theſe important circumſtances were communicated to the Miniſter, during the late peace, by the Earl of Breadalbane, Mr Addington the then miniſter did not deign ſo much as to

give

give his Lordſhip an anſwer to his letter. At preſent, it is not poſſible to expect a better fate; although Mr Pitt certainly declared to a friend of mine, who preſented him with my pamphlet, that if ever he came into adminiſtration, he would act upon it. And I think, if things had not turned out ſo adverſe, that he would have done ſo. Nothing can be expected, however, in the preſent circumſtances of the country, where all our efforts muſt be directed to preſerve us from being ſwallowed up by that power which ſeems to carry every thing before it.

'I ſhould be very glad to have it in my power to render your talents and induſtry uſeful to yourſelf and the country; and there are ſome meaſures in contemplation that in the courſe of next ſummer I think may enable me to do ſo, and which, be aſſured, I ſhall not omit mentioning to you as ſoon as they come to any bearing.

'And I remain, yours truly, R. FRASER.

'*P. S.* Is Dr Coventry's proceſs for purifying ſmall ſalt publiſhed?—I ſhould be very glad if you could come and ſtay a week or two with me here.'

On the beſt method of preparing and purifying common ſalt, ſeveral inquiries and experiments have of late been inſtituted, and different ſocieties have offered premiums for information on the ſubject. Such exertions on the part of individuals and ſocieties, not only demonſtrate the ſenſe which the public have of the importance of this inveſtigation,

but it forms an important link in the chain of evidence which I have attempted to adduce reſpecting what Government ſhould do towards the eſtabliſhment of the fiſheries of theſe kingdoms. There can be no doubt, but that when the dangers hinted at by my friend Mr Fraſer are removed, and Government can calmly and deliberately turn its attention to this great national object, the ideas of all the men of ſcience and of obſervation, who have turned their attention towards the ſubject, and who have no perſonal intereſt to ſerve in what they propoſe, will be adopted and acted upon.

That common ſalt is chiefly compoſed of the muriate of ſoda, is a fact which has been long and generally known. But there are other ſalts combined in ſea-water and in rock-ſalt, from which the ſaline ingredients of the ſea ſeem to have been derived, which poſſeſs qualities very different from thoſe of the muriate of ſoda, and which, when mixed with it in conſiderable proportion, tend greatly to deſtroy its antiſeptic power, and, of courſe, its uſe for culinary purpoſes. Theſe adventitious ſalts which debaſe common ſalt, ſo far as yet diſcovered and deſerving of notice, are,

1. Muriate of Magneſia.
2. Sulphate of Magneſia.
3. Muriate of Lime.
4. Sulphate of Lime; and,
5. An occaſional admixture of Sulphate of Soda; for this laſt mentioned ſalt is not univerſally preſent, either in ſea-water or in rock-ſalt.

It

It may be laid down as a general principle, founded in experiment and obſervation, that ſalts with earthy baſes are, with few, if any exceptions, not only unfit for culinary uſes, but produce or promote the rapid decompoſition of all animal ſubſtances. Such, therefore, are unfit for preſerving either butcher-meat or fiſh; and, as already hinted, the more theſe ſaline impurities abound in common ſalt, the leſs adapted is it for that purpoſe.

Various conjectures have been formed to explain how ſuch a deſcription of ſaline matters produces this effect. It is not improbable, but ſalts with earthy baſes act on animal ſubſtances in the way of double elective attraction. The putrefaction or ſpontaneous decompoſition of animal ſubſtances, by the new combination of their principles, generates alkalis, which, uniting with the earthy ſalt in contact with it, decompoſes it by abſorbing its acid, for which acid the alkali has a greater affinity or attraction than the earth. Thus it happens that earthy ſalts and animal ſubſtances effect their mutual decompoſition; and unleſs there were a predominant, or counteracting proportion of muriate of ſoda, or ſome other ſalt of an alkaline baſis, which no ingredient exiſting, or forming, in the compound, was capable of decompoſing, the application of earthy ſalts alone, would produce a more rapid decompoſition of animal ſubſtances, than if left to their own tendency towards putrefaction.

Whether, however, the opinion now ſubmitted be well-founded or not, it is certain that ſalts of earthy baſes operate the deſtruction of animal ſubſtances exactly in the ratio of their ſolubility in water. This liquid conveys the ſalt into every pore or interſtice of the animal ſubſtance, and ſo places it where it can either reſiſt or promote decompoſition.

1. The moſt ſoluble, as well as the moſt generally diffuſed, and the moſt copious of the earthy ſalts which contaminate common ſalt, whether derived from ſaline rocks or from ſea-water, is the muriate of magneſia. It is chiefly to its preſence that the bitter, unpleaſant taſte both of ſea-water and ſea-ſalt is owing: and it not only gives to the latter an unpalatable or naufeous taſte, but it leſſens greatly its antiſeptic power, or its value as a culinary article for curing fiſh or meat. It is this ſalt, too, which principally conſtitutes that liquor which remains in the ſalt-pans after the cryſtals of common ſalt have been collected, and which, from its taſte, is known by the emphatical name of *Bittern*, from which liquor, that well known medicine magneſia is precipitated.

The muriate of magneſia has an attraction for water ſo great, that it can hardly be reduced to a ſolid form, not indeed till it has been evaporated to a thickiſh conſiſtence and then expoſed to great cold. On expoſure to the air it attracts moiſture, or deliqueſces. Now, as common ſalt chiefly conſiſts

ſiſts of the muriate of ſoda, the chryſtals of which are leſs ſoluble in water than the muriate of magneſia, when the former are produced and removed from the mixture, they contain, locked up in them as it were, and exteriorly attached to them, a conſiderable proportion of the latter; to the preſence of which, common ſalt chiefly owes its tendency to become damp, and, in ſome caſes, when the other occurs in a great proportion, its actual deliquefcence. The rapid way in which the evaporation of ſea water is conducted for the purpoſe of preparing ſmall ſalt from the pans, is one cauſe to which the greater impurity of ſome ſorts of that article than others is to be aſcribed; but howſoever cautiouſly the boiling is conducted, it is extremely difficult, if not impoſſible, to get entirely rid of it. Indeed, in ordinary caſes, the expenſe attending ſlow evaporation is ſuch as could not well be defrayed by the price which that article brings when applied for common purpoſes,—the curing of herrings and the like.

Different opinions are entertained about the cauſe of the injury done to common ſalt by the remains of the bittern, or the admixture of the muriate of magneſia. Perhaps its injurious effect may be owing, as I am inclined to think, 1. to its extreme ſolubility; and, 2. to its being decompoſable by vol-alkali, which is readily evolved in the decompoſition of animal, and even of many vegetable ſubſtances.

2. Another impure ſalt, with an earthy baſis, to be met with in common ſalt, is the ſulphate of magneſia, otherwiſe called Epſom Salt, from the circumſtance of its abounding in the water of ſprings near that place in England. This ſalt, uſed in medicine, may be collected either from ſuch ſprings, or, as is now uſually done, from ſea-water; for it remains in the bittern after the common ſalt has been collected. Indeed, next to the muriate of magneſia, it is the principal ingredient in that liquor. This ſalt is much leſs ſoluble in water than the other ſaline impurity, the muriate of magneſia; and its deliqueſcence, like that of common ſalt, is chiefly owing to its being mixed with it; for it effloreſces on expoſure when pure or unmixed with the other ſalt.

This ſaline impurity, which has, like the other, a very bitter taſte, though perhaps one leſs naufeous, is more ſoluble in water than the muriate of ſoda, and, of courſe, is apt to remain intimately confined in or attached to the cryſtals of the latter, when they are forming in the pans or evaporating veſſel. At a low temperature, about 60° of Farenheit, this ſalt will diſſolve in its own weight of water, and in three fourths of its weight, when the water is boiling hot.

3. The third deliqueſcent and pernicious ſalt, is muriate of lime. This ſalt, though its attraction for water be great, can be preſented in a cryſtallized form in the ordinary heat of the atmoſphere. It

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is hence leſs pernicious than muriate of magneſia; and is ſtill leſs hurtful, in ſo far as the vol-alkali evolved in the decompoſition of animal ſubſtances does not decompoſe this ſalt. It may be decompoſed after the putrefactive proceſs, which is a ſlow inflammation, has proceeded ſo far as to evolve, or generate, the fixed alkalis. But its exiſtence in rock or ſea-ſalt, though univerſal, is often ſo ſmall in quantity as hardly to deſerve notice.

Theſe three being the principal deliqueſcent ſalts known to exiſt in common ſalt, which operate by inſinuation into every pore of the animal ſubſtance to which they are applied; it ſeems leſs neceſſary to enter into any diſquiſition concerning ſulphate of lime, which, from its extreme inſolubility, ſeems only to effect the decompoſition of animal ſubſtances by a ſort of mechanical contact.

It has been already ſtated, that the moſt impure or injurious ſalts in the compoſition of common ſalt, are not only extremely ſoluble in water, but have their ſolubility very much increaſed by heat; whereas the muriate of ſoda is nearly of equal ſolubility in hot as in cold water.

On this principle, the Earl of Dundonald contrived a method of purifying ſalt, deſcribed in the firſt volume of the Tranſactions of the Royal Society of Edinburgh, by pouring upon it ſaturated ſolutions of pure ſalt of a boiling heat. Theſe brought into ſolution the deliqueſcent, or highly ſoluble ſalts, carried them down through the maſs, and cauſed them to ooze or drain from the veſſel,

whoſe ſhape was that of an inverted cone. But it is evident this proceſs required a conſiderable conſumption of pure ſalt; and the impure ſalts, having no other force but their gravity to carry them down, this was counteracted by the corpuſcular attraction; and a conſiderable proportion of them remained ſuſpended among the particles of pure ſalt, like water in a ſponge. Hence this purification was not only expenſive but partial. Notwithſtanding the paſt difficulty in procuring common ſalt in a pure condition, there is reaſon to hope, from the ſucceſs of ſome recent attempts, that this important object will yet be accompliſhed. The ſimplicity and efficiency of Dr Coventry's plan, eſpecially if combined with certain arrangements of ſmaller moment, have already been hinted at.

But it ſeems impracticable to carry any plans of this ſort into effect without the aid and aſſiſtance of Government. In all the ſchemes hitherto adopted for the improvement of the fiſheries, Government have uniformly aimed at attaining the end, without inveſtigating the means indiſpenſably neceſſary towards its attainment. They have acted like the projectors deſcribed by Dean Swift in Gulliver's voyage to Laputa, who had invented a new and more ingenious mode of building houſes, than the vulgar and antiquated practice of beginning at the foundation, and building upwards. Inſtead of this, our ingenious projectors began at the roof, and built downwards.

ON OSSIAN'S POEMS.

In the preceding part of the work, frequent mention is made of the popular traditions in Arran concerning Fioun Mac Cowl, and his heroes. Their notions correſpond remarkably with the poems publiſhed by Macpherſon. Similar traditions prevail through the Highlands and Iſles, from Arran to Caithneſs. Many remains of rude forts derive their names from Fioun and his heroes. Of this we have an example in Dun-Fioun in Arran. I was ſhown ſeveral graves that were ſaid to be thoſe of his heroes. Of this there is an example at the junction of Loch Duich with Loch Luing, oppoſite to Kintail. Here a large grave is ſhown, marked out by rude ſtones, which is ſaid to be the grave of Diarmid and his dog. This hero is the reputed anceſtor of the Campbells; and, till of late, when the people of Argyleſhire came here to the herring fiſhing, they were wont to walk round this grave on their bare knees, in the courſe of the ſun, and to perform many ſuperſtitious rites in honour of the hero's ghoſt. A heap of ſtones is alſo ſhewn, on a rock detached from the ſhore, which is ſaid to have been

been his caſtle, or place of reſidence. Mountains alſo derive their names from Fioun and his heroes. Of this we have an example in the Cuchulin mountains in the iſland of Skye, which are ſuppoſed to have been named from Cuchulin, whom Oſſian diſtinguiſhes as *King of the Iſland of Miſt.* In the diſtrict of Slate, facing the mountains which are known by his name, the ruins of Cuchulin's caſtle are ſtill ſhown, on a peninſular rock projected into the ſea, and built of dry ſtone. In very remote and little frequented parts of the Highlands, I have heard poems recited, which were ſaid to be poems of Oſſian. Thoſe who underſtood both languages, declared their inability to convey their ſublimity and pathos in Engliſh; but on deſcribing their ſubjects, I found ſome of them correſponded with thoſe tranſlated by Macpherſon; others not.

In Glenco, the place is ſhown where Oſſian is ſaid to have reſided, and to have paſſed the evening of his days. The wild and awful ſcenery of that place, the mountain torrents, the woods and heaths, make a conſpicuous figure in his poetry, and are the ſource of moſt of his imagery; while the columns of miſt, and the drifting vapours, ſometimes hovering on the ſummits of theſe rugged pyramidal mountains, preſent even to the dulleſt imagination a lively idea of gigantic ghoſts ſtalking from mountain to mountain; or chaſing the deer

deer in the fields of air; or enjoying the feaſt in their airy halls, ſurmounted by a canopy of miſt.

It is not my intention to bring forward all the facts which ſatisfy me that there were traditionary poems among the Highlanders concerning Fioun and his heroes. Such as occurred to me ſhall be ſtated afterwards, if this work advances further.

But the univerſality of the traditions concerning Fioun, among a people ſcattered over ſuch an extent of country, who have no communication with each other, proves two things. 1ſt, That there were poems which celebrated his exploits. 2d, That theſe poems were indigenous, and not, as Mr Laing alleges, borrowed from Ireland. In fact, the traditions concerning Fioun, and remains of the poems, prevail more in thoſe places which have no communication with Ireland, than in the South Highlands which have communication.

It forms no objection to this, that the people commonly believe Fioun to have been a giant, and aſcribe exploits to him beyond the compaſs of mortal ſtrength. The people in the low country aſcribe exploits to Wallace, far beyond the power of human ſtrength. But would it be fair, from this circumſtance, to conclude that no ſuch man as Wallace ever exiſted?

Dr Johnſon ſhewed his critical acumen, by denying the Poems of Oſſian, while he believed in the ſecond ſight; a folly which is now explod-

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ed by the Highlanders themſelves. The want of manuſcripts is the great objection he urges. But the firſt compoſitions of all rude nations are in verſe, that they may eaſily be retained upon the memory. The firſt writing was upon ſtones; and it would take a very long time to write a heroic poem in this way; and after it was written, it would be much eaſier carried on the memory, than on the book. But the Highlanders had an order of bards, whoſe buſineſs it was to learn and recite their beſt poems, and to compoſe new ones on the exploits of their chieftains. Their language ſeems eaſily to run into verſe; for I have ſeen a herd lad, who could not read, keep a company in a roar of laughter a whole evening, by ſatirical ſongs againſt particular individuals. They muſt have been extempore; becauſe I was ſometimes the ſubject of them myſelf.

This argument ſeems equally to militate againſt the authenticity of Homer's poems. It is certain that writing was either not known, or very little practiſed, in Greece at the time he flouriſhed. Every word which he applies to verſe, indicates that it was not a thing written, but ſpoken, or ſung. Lycurgus is ſaid firſt to have reduced his poems to writing, that he might inflame the Lacedemonians with martial ardour; and Solon is ſaid to have methodized, and reduced them into their preſent form.

Such

Such of Oſſian's poems as I have heard, appeared to be detached epiſodes; and whether Macpherſon has uſed liberties with his originals, or tacked a number of them together, I cannot decide. But, that he had originals, either copied from the mouths of people, or from manuſcripts, can hardly admit of doubt.

Nor do I ſee much in Mr Laing's argument of a ſimilarity in the imagery and expreſſions of thoſe poems, to the ſacred Scriptures, and other compoſitions. Every poet who deſcribes nature, muſt frequently introduce images and expreſſions ſimilar to thoſe uſed by others. Had Oſſian been repreſented introducing lions, elephants, and animals he never ſaw nor heard of, the forgery would have been palpable. He introduces nothing but what is viſible in a mountainous country, interſected by the ſea, and diverſified by iſlands. Had Macpherſon been capable of compoſing theſe poems, he muſt have been the moſt extraordinary genius that ever exiſted. He muſt have contrived a ſyſtem of manners very different from any thing he ever ſaw or read of; and muſt have confined himſelf within a ſelection of objects, peculiar and appropriated to the manners, without ever diverging into any circumſtance which might betray his impoſture. Walking on the ſlack wire is nothing to this.

Annexed

Annexed, is an extract from a letter relative to this subject from the Rev. Mr John Stewart, minister of Kilbride, with a note by the Rev. Dr MacKinnon.

'*Kilbride*, 14. *Jan.* 1805.

'In the account I gave you of the island, which my father made out for Mr Pennant, you will find what you want about Fingal. It is believed here, that Fingal took Arran for a resting place, on his going to assist his allies in Ireland, having come down Loch Fine in boats, or birlings. He landed at Machrie, where there was a fine natural harbour, which I showed you; resided in the Coves on Drummodoon shore. There is a farm in that district, where he kept his feast of shells. You may remember a number of stones on the farm of Tormore. This is the place where he held a court of justice. One large stone, where the pannel stood, is called the Pannel's Stone. Arran was, at that time, well stocked with red deer. On Fingal's returning from Ireland, he spent some considerable time in hunting. It is said that Ossian died in this island. My father, when a young man, heard his poems repeated by the old people, the same that are recorded by Macpherson, making some allowance for little alterations. Annexed you have a note I had lately on this subject from my friend Dr MacKinnon.

Kinnon. Mr Laing is entirely wrong in what he ſays with regard to Oſſian.

" The learned Dr Samuel Johnſon, in his " Tour to the Hebrides, aſſerts, in his uſual dog- " matical manner, that there is not a book in " the Gaelic language, that is an hundred years " old. But the good Doctor ſhould have been " better informed, before he ventured to make " ſuch an aſſertion. For, in the Duke of Ar- " gyll's library at Inverary, there is a book ele- " gantly printed in the Gaelic language, as early as " the year 1567; and, in the 19th page of that " book, the author, Mr John Carſuel, ſuperin- " tendant of the clergy in Argyllſhire, laments, " with pious ſorrow, that the generality of the " people under his paſtoral care, were ſo much " occupied in ſinging and repeating the ſongs of " their old bards, particularly thoſe that celebrat- " ed the valorous deeds of Fingal and his heroes, " that they entirely neglected the Scriptures, and " every thing relating to religion.

" The whole of this book is compoſed in very " pure Gaelic; but particularly, the dedication to " the Earl of Argyll is written with more claſſical " purity and elegance, than any compoſition I " ever ſaw, either written or printed, in that " language.

" This is not hearſay evidence, my friend; for, " the laſt time I was at Inverary, I read the book

" from

" from beginning to end; and, in the courſe of
" the evening, repeated to the Duke a ſummary
" of its contents: for which his Grace thanked
" me, in his uſual mild and polite manner; ob-
" ſerving, that he never before had met with
" any perſon, who could give him any informa-
" tion with regard to the ſubject-matter of that
" book, though he had ſhown it to many whom
" he thought were good Gaelic ſcholars.

(Signed) " J. M'K. "

FINIS.

D. Willison, Printer, Edinburgh.]